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NOV. 22, 1954

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Phillips 66 PRESENTS

MILESTONES IN AVIATION

## How a Failure Brought Success to U. S. Army Aviation



In March of 1916, almost seven years after its origin, the U. S. Army began, took its first actual air action. The Army's first Aero Squadron started operations at Columbus, New Mexico, commanded by Capt. Benjamin Foulois (now Major General, U. S. A., Ret.) who later headed the Army Air Corps. Here for the first time, U. S. Army aviators and airplanes cooperated with the cavalry—as partners in border



For the past 30 years, Phillips research and development activities have always been deeply concerned with aviation. Indeed, a large per cent of the Phillips research staff is continually working on problems related to aviation.

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AVIATION PRODUCTS

## Domestic

Third F2Y-1 Sea Dart is scheduled to begin flight tests at Cassen's San Diego plant within two months, indicating trials that were broken off when the second supersonic rocket-based fighter crashed Nov. 4 (AIRCRAFT WEEK Nov. 15, p. 20). Cassen says extra work crews are speeding completion of the third Sea Dart.

Convair Torneo, Navy's answer to a guided missile with an airframe speed of Mach 2, has been used successfully by the converted battleship USS Mississippi in the air defense phase of the Atlantic Fleet's largest power exercise.

Vertical takeoffs could be made by Douglas Aircraft Co.'s 70,000-lb. A1D Skyraider with 12 Kato boosters to supplement its two Pratt & Whitney A1J turbojets, says Harry A. Nishida, A1D project engineer at the El Segundo (Calif.) Division.

Robust, altitude record of 45,700 ft. has been set by USCGC Capt. Edward G. Speers and Lt. J. Henry P. Nicklas during tests in a staged down Boeing B-47 of the new downward ejection seat. Previous record: 42,000 ft. set in 1950.

Reg. Gen. Charles A. Lindbergh returned to temporary active duty with USAF last week for the first time since he resigned his commission in 1951. He will serve three months in the office of Travis Cadden, special assistant for research and development to the USAF Secretary.

Engineering & Research Corp., Ramoth, Md., aircraft equipment and electronics builder, has been acquired by ACF Industries, Inc.

Budget Bureau has completed a three-month study of Air Coordinating Committee, G-4, ACC is a useful and necessary federal agency.

Bendix Aviation Corp.'s Pacific Division confirms that it hopes to get helicopter operators to use the Decora armament and ground transmitting equipment (AIRCRAFT WEEK Nov. 15, p. 17). The division has entered U. S. civil aviation and sales rights to the British-developed system, will begin redesigning to U. S. specifications immediately with pilot units make for evaluation at approximately 90 days.

C-130 Hercules is the new official name of Lockheed Aircraft Corp.'s troopship-military assault transport.



Russian Light Copter Lands on Truck

Small Russian heavy helicopter demonstrated its ability to land quickly by setting down on the back of a small truck at Tbilisi Airport near Moscow following a demonstration flight. The copt has dual three-blade main rotor blades.

Maj. Gen. Gordon A. Blake has been appointed USAF member on the executive committee of Radar Technical Committee for Aerospace. "The appointment reflects the determination of the Air Force to achieve further development and implementation of a common vision," says RTCA.

## Financial

General Dynamics Corp., New York, reports a consolidated net income of \$12,544,826 for the last nine months of 1954, an increase of 17% over \$9,777,061 for the same period last year. Net sales totaled \$431,017,238, compared with \$356,789,199. Bookings Sept. 30, approximately \$921 million plus an extended \$410 million in contracts on air negotiation.

Corvus-Weight Corp., Wood Ridge, N. J., had a consolidated net profit of \$31,464,787 for the first nine months of 1954, increasing from \$8,059,776 for the last three quarters of 1953. Sales climbed to \$148,263,139 from \$137,085,461. Bookings Sept. 30 approximated \$736 million, dropping from \$753 million of mid-year.

Western Air Lines' net income for the first nine months of 1954 totaled \$1,017,134, compared with \$1,046,163 for the same period of 1953. W.A.L. paid a regular quarterly dividend of 15 cents Nov. 15 to Nov. 1 stockholders.

Emery Air Freight Corp. has declared a one-cent dividend of 10 cents per

share, payable Dec. 15 to stockholders of record Dec. 1.

## International

Suavo Vantour averaged 734 mph., during a record 3,675 mi. flight. The French fighter, powered by two Sorena Avon 3110s, crashed out near Anfield in France 50 min. after it took off from Villacoublay.

East German Luftwaffe has postponed its first flight to December, probably because of Vienna report. The Communist airline originally planned to start operating in 15 German airports as weeks before the Bonn Charter the north (AIRCRAFT WEEK Oct. 18, p. 31-4).

De Havilland Venom has been re-ordered by Britain's Air Ministry in various types of aircraft and use of wingtip tanks, press reports from London disclose.

Snub 52 engine will be produced as a two place fighter, the fourth version for Sweden's 700 mph. plus multi-purpose jet aircraft.

Miller L34-128 helicopters has been purchased by Philippine Air Lines, the fifth of this type ordered by PAL in 1954.

French government has opened a credit of \$1,512,000 for aircraft equipment and \$1.2 million for aviation gas reports from the dollar zone.

**STOP ON TIME**

The B-47 Jet Bomber is built to GO and go it does with a speed that challenges the imagination (London, England to Limestone, Maine in 4 hours and 43 minutes) even in this day of supersonic speeds by smaller planes. But when it's time to come down, landing and stopping this 6-jet aircraft must be done with both accuracy and dependability. To accomplish this, Boeing Airplane Company uses Pioneer specially-built deceleration 'chutes' to approach the runway and longer ribbons 'chutes' to shorten the landing roll — a maneuver that has won the praise of the aviation industry — of which Pioneer is proud to be an integral part.

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November 22, 1954

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THUNDER REPUBLIC F-84F slips under flying boom, refueling nozzle maneuvered by the operator under Boeing KC-97 tanker

## Jet-Rocket Planes Make Up U.S. Team



SUPERSONIC TWINS are USAF Bell X-1A, experimental, and X-1B, standard except for instrumentation. Rocket-powered planes are at Edwards AFB, Calif. X-1A attained 1,050 mph speed, 90,000 ft altitude



REVEY OF CUTLASS, with uniquely socket pods, overt defense at Chance Vought's Delta plant in New Bedford at both coasts. The F-100's two Watlingham J60 WE2 interceptors have streamlines. Struts on lower portions of F-100's tail rods. Experimental loads. Do not panic.

LONG PLANE shows from afterburner of P-51, J17 engine in supersonic North American F-80A Super Sabre during night work



## INDUSTRY OBSERVER

► Boeing XB-47D, powered by a combination of turbojets and turbojet engines (Aviation Week Apr. 19, p. 14), now is scheduled for flight about Dec. 15. Aircraft will have Wright T49 turbojets for each inboard pod normally housing two General Electric J47s. A J47 remains in each outboard pod.

► All France Constellation recently made a completely automatic approach to touchdowns at Orléans, Paris, with the plane controlled by Volpex Powers T-60 10 autopilot with automatic approach coupler. Pilot took over only after the team which touched the runway.

► Boeing B-33 reportedly handles better than the B-47 in refueling from a KC-97 tanker because of better low-speed characteristics.

► Army selection of helicopter prototypes will be brought to their ability to operate on two fuels, Graco 33/51 Automotive and Graco 330/116 Aviation. Army plans to use only those two fuels to reduce engine operations to simplify the logistics problem.

► Glenn L. Martin Co.'s B-57C will have three-dimensional control surface that the original model of the American-operated Canberra light bomber. Early tests of the B-57A by Tactical Air Command revealed the three-dimensional of the British design.

► Transition of pilots from the B-47 to the B-52 requires only about 15 hr.

► Problem of dent is causing increasing concern to the Army in its helicopter operations. In a recent test under simulated dent and dent conditions no engine failed after only 15 hr of operation in a helicopter. Lack of repeated reduction in vibration is causing the Army about 55,000 daily.

► Boeing and USAF reportedly are looking for a new source of B-52 defensive fire control systems. Present equipment is under development by Avionics and General Electric. Avionics is under development and General MILs are mentioned as possible new suppliers.

► Russia is lagging "far behind" the U. S. in transistor developments, use of two Russian engineers visiting the recent Baltimore armaments conference told an observer. Both showed considerable interest in a General Electric model of a radar equipped an electronic gadget plane and in Westinghouse recordings of bomber and interceptor fire control.

► Bell Aircraft's Helicopter Division is trying to interest the Navy in a utility version of its Model 47, tentatively designated the HCU. Copier will carry four persons, or two pilots, in structural and pilot. It has demonstrated its ability as a rescue boat using a Navy boat. Bell plans to use 47 as the new designation for the 47G-1 (Aviation Week Nov. 8, p. 15).

► Piper Aircraft has sold its Apache twin-engine aircraft production for next six months. Now producing slightly more than one a day, firm may institute program to slowly double output. Avionics in Rogers, Colorado, has ordered the Apache for passenger service.

► Helicopter accident rate for USAF is nearly three times the rate for all aircraft. Improvements are needed in landing gear, control and pilot selection of blade stall, and study report done.

► Second engineers believe that an oval-flow jet engine, developed along by gas principle, could be the next quest of rotor tip propulsion devices for copiers.

► Rich Helicopters, major commercial operator, keeps 12 kg loads for each aircraft. They record history of engine, engine, transmission, engine water, main plate, main, stabilizer, tank, main rotor blades, tail rotor blades and tail rotor gear box.

## WHO'S WHERE

### In the Front Office

Dr. T. E. Wright, former Civil Aeronautics Administration (1944-45) and now vice president-general at Curtiss-Wright, N. Y., has become president of air transportation at the university's School of Engineering and Public Administration.

George T. Gurnea has been appointed vice president in charge of flight operations for Flying Tiger Line.

K. W. Richardson is now vice president for Lockheed Aircraft Corp., Atlanta, Ohio. Other changes: Chase W. London, vice president, Lockheed Aircraft Corp., and vice president, Lockheed Aircraft Corp., and vice president, Lockheed Aircraft Corp.

Thomas D. Sullivan has moved up to vice president-general at Bell Co., Newark, N. J.

A. Langston has become a director of British Overseas Airways Corp. in charge of British Overseas Airways Corp. in charge of British Overseas Airways Corp. in charge of British Overseas Airways Corp.

James A. Keady has joined Flight Safety, Inc., Flushing, N. Y., as assistant to the president.

### Changes

Dr. Lewis G. Smith has resigned effective Dec. 15 as director of Air Transport Ass'n's Executive Research Division to accept the Walter Roper Brewster Foundation as Vice president at the University of Washington, Seattle.

Donald H. Carpenter is now manager of Flight Safety Foundation's Air Transport Division, New York.

La. Gen. Doris D. Hickey (USA Ret.) has been appointed director of Commercial Motion Corp.'s New Products Division, Detroit. Division manager: H. J. Bittner.

Thomas J. Keady has become general manager and sales manager for Lockheed Aircraft.

James R. Kerr is director of Aero-Mechanics Corp.'s new West Coast Division, Los Angeles.

Kenneth F. Winchell has been named quality control director for Republic Aviation Corp., Farmingdale, N. Y.

Dr. Kenneth S. Elfrink has been named chief of Research Electronics Products, Inc., New York, by industrial director.

Earl B. Baker has moved up to chief pilot testing test pilot for North American Aviation, Inc., Los Angeles, according to the Control Watch.

### Honors and Elections

Warren H. Brand, engineering and technical director for Canadian Corp., is now president of the Institution of Society of Aeronautics.

John D. Riden, dean of the School of Engineering at Michigan State College, has been elected president for 1955 of the Institute of Radio Engineers.

Carl W. Zimmerman, president of Industrial Board Control, Inc., has become president of the National Aeronautics Council.

# "Fleet Fighters"



Pilot Chance Vought F4U-1 Corsairs stand poised on the flight line, ready for delivery to fighter squadrons of the U.S. Fleet. Outstanding examples of Naval Aviation's new hard-hitting strength, these swift, powerful aircraft are designed to serve as interceptors, lighters or attack planes.

## Chance Vought Aircraft

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*Quoted from talk by Elmer Johnson, Chief Navigator, Scandinavian Airlines System, before S.A.S. meeting in Atlantic City on June 11, 1947*

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*Model shown is one of Bendix Aviation Corporation*

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## Washington Roundup

### USAF Combat Revolt?

USAF shortly will have to cope with a revolt by its combat commanders against the slowing growth of bookkeeping activities. Many air bases have in many camps, as pilots, some report more "bookkeepers" than fighting men.

No one challenges the need for good management in the ultra-expensive Air Force business. Complaint is that the system has developed too much overhead in the wing and base level.

Separate personnel are so bogged down with costing, budgeting, accounting and official check and list requirements that they now feel the price can be measured in tens of \$500,000 airplanes. These planes might have been saved, if the commander had been free to use his hard-gained experience supervising the flying and the training of his personnel.

Most important, it may be paralyzing the commander with loss of combat initiative. One top combat leader says: "If present trends continue, we will lose exactly how we spend every penny, but we will have lost our combat capability in the process."

### Community Airline

Local backing, which Civil Aeronautics Board members have been urging for local service airlines, will be reflected in the reorganization of Lake Central Airlines. Management and control will be with employers and representatives of local business and financial interests. Reorganization arrangements probably will be completed this week.

### Offensive Seaplanes

Naval Aviation leaders are pressing an offensive role for the seaplane in conflict waters. James H. Smith, Jr., Assistant Navy Secretary for Air, told an American Legion post in New York that "two or three seaplane squadrons in an area thousands of miles from American soil could maintain a base to an extent land and regular is driven out on enemy defenses from which forces without exposure vulnerable land bases to an enemy's counterattacks."

"The seaplane can soon be given the speed and altitude and load-carrying capabilities of land-based jet bombers. It can be given the ability to operate from air-shattered bay, and, because of its ability to land on water, it can be given the capability to land in semi-deserted sea areas, avoid a waiting submarine and proceed on its mission."

With these capabilities it could deliver powerful weapons to vital targets. With perhaps half a dozen airplanes a single tender, and a pair of tanker submarines, we could provide an integrated force that no enemy could not ignore. Once nuclear propulsion can be fitted to the airplanes—and for this they appear ideally adapted—the submarines could be deployed with and the tender base moved still further back, out of attack range."

Smith criticized Navy's argument against land bases. He said an increase in the range of ocean weapons would make "our invulnerable home bases vulnerable to sudden, overwhelming attacks which could prevent our counter attack." And, says Smith, the overhauling observation task is the primary basis of nuclear warfare defense.

"The counterattack potential must be dispersed on aircraft carriers," meaning bases, he believes. He also

mentions a carrier strike force composed of three large carriers, seven escorts and two high-speed supply ships.

### \$3 Billion for Transports?

Airport may have to spend up to \$3 billion on new planes and equipment over the next ten years, Air Transport Ass'n's president Earl Johnson believes. It will be for "minimal replacement" of aging propeller engine fleets with turbojets, "specially designed" cargo fleets, "improved" replacements with helicopters, addition of a "colossal" fleet of air ferries, new ground, flight line and service equipment.

Civil Aeronautics Board member Oswald Ryan recently estimated the cost to airlines in converting from piston to turbo-propeller transports over the next 10 years at \$1 billion (Aviation Week Nov. 1, p. 51). Both Ryan and Johnson proposed bigger price tag figures, though the latter—airline must to government subsidy.

### NATO Fighter Decision Near

Decision on lightweight fighter planes of European design that will be bought by NATO will be made soon by chief of Donald A. Quarles, Assistant Secretary of Defense for Research and Development. USAF is providing technical guidance in selection of a design, which must be a first-level fighter-bomber to support ground forces. For this reason, among others, Folland Gnat type not be acceptable.

For a main, Quarles and his USAF advisors have a report of a board headed by Dr. Theodore Van Korman which presumably has listed possibilities. A final selection is expected at least by early December.

The plan to plan that can be built will come under the Mutual Weapons Development Program, formerly called the Mutual Special Weapons Program, a title dropped because it caused the implication that atomic or nuclear weapons were involved. Aim of the program is to assist the technological capabilities of NATO countries, providing technical and financial assistance.

### Wilson 'Encouraged'

Look for Defense Secretary Charles E. Wilson to get an increasing number of visits to aircraft plants. Much from his second visit to the West Coast, he told reporters he felt "greatly encouraged" by the local work adding that he is "determined to make a lot more trips like this to see what the industry is doing."

Asked whether U.S. is working on the satellite space jet program examined by Secretary Forster in 1949, Wilson said he was not aware of such a project. When a newspaper told him there are reports that the Russians are pushing work a satellite and may beat our satellites in the race for space space, Wilson said, "I wouldn't care if they did—that is far off to the moon or some other place." He added that he knows of enough problems on earth with our looking for more orbits.

More recently, his Secretary predicted that the fiscal 1950 defense budget will be more than \$20 billion. He said the Defense Department has been spending money faster than it is appropriated, making it essential to be in the accompanied balance on hand and letting some other funds lapse. By this process, he said, about \$17 billion has been cut from the unexpended balance in the past three years.

—Washington Staff



is not determined at Fairchild, but that preceding in the form of excessive static loads tends the value of the structure by fatigue testing, and (b) a fatigue test has been conducted to test fatigue data not present in a valid specimen for static testing.

In addition, components probably equivalent to another complete structure will have to be supplied for testing to determine if an additional decrease in average fatigue life, by dividing by three, then increases life life.

• Second, flight tests will include extra, even flying over proposed areas with a new, untested model.

• Third, ARB will add one or more members, pulled for "over resistance to the aircraft life."

• Fourth, an expanded research program will investigate the whole problem of fatigue in light aircraft.

• Fifth, the FAA will conduct a study. This latter, although not presently a new pre-acceptance requirement, is expected to result in new conditions of test for both components and full aircraft design.

ARB does not expect a final task, fatigue testing to destruction will be required for the candidate planes. Apparently what is at issue is the need for expanded proving of fatigue and with this is the area of a new series of aircraft tests will be accelerated into a coherent and reliable set of rules relating fatigue life to various design. When that is done ARB indicates pre-acceptance testing may be modified.

• Second, Fairchild has been not been opposed to the FAA. No attempt was made to prove DM was right in everything it did. In fact, it actually was admitted that, in the light of what is known today, both the company's calculations of stress and fatigue levels of the main and fuselage strength of the aircraft were flawed.

Chief designer R. E. Bohm said "We obviously missed the point."

About the rule book, he said he believed that the FAA was to do, that it had used properly all the information available at the time of the Conquest's development, had subjected the Conquest to tests in excess of what normally is ARB's, had conducted flight tests. Arguments in Civil Aeronautics Administration's rules and recommendations, and that even today there was a considerable amount of lower, especially disagreement over the relative values of proposed tests in general, environmental calculations, and importance of stress peak readings and how best to calculate stress.

For example, evidence in potential statistics that EDI and performance of other stress analysis methods in those of Sir Arnold Hall, RAE director.

In this latter context, however, the proving phase of evidence would seem to be the fact that two Conquests failed

in flight what what appear to be fatigue failure due to excessive stress in certain areas and that one test transport failed for the same reason in RAE's tests.

• Conquest 2 Delay—There are reports that de Havilland is striving to modify these Conquest 2s that were under construction. Even so, a considerable delay in the delivery of the aircraft normally must result. It seems obvious that the new Conquest 2 also will have to undergo extra tests.

Another point raised is the fact that the Conquest 2 presented with a lighter skin and with its structure being up most weight over than the original model on which all data were based. Some doubt remains whether the airlines that ordered Conquest 2s now will have these doubts as to the future of the Conquest as a commercial aircraft, at the most then speculation is possible. The Conquest 1 apparently is finished.

Some criticism is that the Conquest 2 cannot do as well as the Conquest 1 for another 15-20 months. By then its competitors from other jet types and turboprops would be considerable.

There is considerable talk that the government may buy up the remaining Conquest 2s in the final model in some form of buyout or that BOAC will be forced to keep its order intact in the hopes of proving the Conquest more a safe and reliable one in a sales base for the Conquest.

One thing is certain. The government will not let de Havilland get into serious financial trouble as a result of this situation. If necessary, there will be a straight bailout of some kind.

But DM hopes this will save the situation, that does not seem to be a wide scale cancellation of Conquest 2 orders.

## New Lockheed Orders To Total \$154 Million

Lockheed, Calif.—Lockheed Aircraft Corp. has in final negotiation an additional \$153 million in military orders for the C-130 Hercules transport.

The orders, to be announced soon, include initial production for "a new airplane not yet publicly announced" and additional purchases of two models now in production.

• \$153-Million Order—Together with Defense Department orders recently announced (Aviation Week Oct. 18, p. 14), these orders total about \$195 million will bring additional business for Lockheed to nearly \$190 million.

Major orders announced there already disclosed include an initial production order for the F-104 day superiority fighter, an additional order for turbo-prop C-130 transports and one for multi-engine B-47 jet bombers.

The F-104 will be produced at Lockheed's Burbank plant. Four F-104s will be manufactured and assembled at Plant B-1, Los Angeles, where the first two prototypes through first assembly and flight testing at Palmdale. Lockheed T-37 final assembly also is at Palmdale.

Factory 3 would manage Don Quibson and the F-104 will be established in a portion of the non-factory occupied by the F-94 line.

• Production Schedule—Lockheed, in a review of current and forthcoming R-1 projects in the Lockheed Star, also reports that the F-104 will be produced in 1956.

• Orders in the C-130A will carry production on the turboprop transport through 1956, with the Burbank plant handling fabrication and assembly of final fuselage section and engine and wing, whereas the upper air cargo door. C-130A manufacture is at Lockheed's Marietta, Ga., plant.

• Orders on hand for production of P-2V new aircraft and jet tanks will continue to be in the structure now. • Production and assembly of jet pods for the P-2V (Aviation Week Nov. 1, p. 24) and for P-2V-6 and P-2V-6, being handled by Lockheed Aircraft Services, will continue to be in the structure now. • The F-104 and F-104 will be on order by delivery into the first quarter of 1956.

## Feeder Policy

- Murray proposes plan to help local service.
- Permanent certificates proposed for "few" lines.

Commerce Undersecretary in Transportation Robert Murray put the Air Transportation quickly before service development of local service airlines in a policy speech last week, depicting a picture that plans are about to turn their routes over to local carriers.

He suggested that "a few" local service lines already have received permanent certificates. He proposed long-term subsidy contracts of "several years" duration to both the government and the local line might show where they stand and could plan accordingly.

• Reasonable Opportunity—At present, neither the government nor the carriers can plan ahead with any real assurance in the subsidy level from year to year, he commented. "At any time, the state of a carrier's affairs, the number of a Civil Aeronautics Board order can immediately throw into uncertainty the amount of subsidy provided."

Murray suggested the reorganization

of the Air Coordinating Committee in local service airlines—such criticism as spurring criticism for the small carriers like the "Strengthen these areas, give them every reasonable opportunity to succeed and then let them succumb to future dominance their future place in the industry."

However, he emphasized that development of the local lines must be a "two-way street."

• Subsidy Transmittal—Proposing that Civil Aeronautics Board establish new tables for subsidizing government subsidy, Murray said "We have not reached a point where the board should be able to establish such goals. It should be the carrier's task, in definite terms, the degree of self-sufficiency which they will be expected to attain by specified dates in the future."

"The carrier should be placed clearly on notice that their success or failure meeting these goals will be a factor in the degree of self-sufficiency which they will be expected to attain by specified dates in the future."

• Funds Development—In addition to suggest subsidy contracts, the program Murray advocated for development

of local service airlines in a presentation to the Airline Deregulation and Modernization Act, scheduled for next week.

• "Considerable reduction" of the route restrictions that now prevent local service carriers from providing flexible limited day service between major points as local service.

These restrictions, he said, "go much too far in limiting their operational flexibility and their ability to develop the traffic potential of their systems. Some of these restrictions actually prevent carrying local service between points not receiving direct service by an other carrier."

Quibling that local service should not duplicate main service, he called for "positive and substantial" liberalization of local service operating restrictions.

• Local service and trunkline in the same geographical area "should be recognized by law, not arbitrary agency action, as their natural benefit, subject to CAB approval."

"To encourage the trunkline to just compete fairly and freely in such a program," Murray observed, "it might be suggested that any carrier which is not certified by a local service line as a result of such voluntary agreement should remain effective only so long as such

carrier retains its identity as an independent local service airline."

"The question of the independence of the trunkline concern that authority now transferred to a local service carrier would, at some future date, end up in the hands of a monopolistic trunkline as the result of a merger to monopoly."

• Airline service should be regarded as points that have demonstrated sufficient traffic potential to warrant scheduled flights. To eliminate, Murray said, about 100 local service stations, estimated an average, of less than three passengers per day during a recent year.

"There remains a need for developing detailed standards as to the minimum level of traffic a community should generate in order to justify continued as service," Murray said.

Communities should then be given a reasonable period within which to meet such minimum standards. If they don't, they should be "expedited" proceedings should be held, he said.

• Local service carriers "can provide significant opportunities for economic improvement, reducing overhead and lowering the wheelbarrow cost." Local service carriers "can provide an active effort to cut costs" by cooperative arrangements for handling such matters as the purchase of machinery and supplies and the control of equipment.

## CAA Tightens Control On Plane Part Export

Civil Aeronautics Administration has ordered tighter control over the quality of used aircraft parts sold for export, placing greatly increased responsibility on manufacturers and repair shops.

The change of a long series of complaints from foreign governments and purchases about unsatisfactory products, the new rule will force CAA safety agents of blame for shoddy shipments. Manufacturers and approval repair shops could lose their certificates if they export defective parts.

George H. Wells, chief of the general maintenance branch, Office of Aviation Safety, says the new regulation is "aimed at improving the quality of aircraft parts exported."

• Defective Products—Some portion of the vast amount of surplus parts always seems to find its way back into use, despite the fact that it was sold for scrap, Wells said.

"The surplus lots it is the best, then, they sell parts that can be worked up or refurbished and put on the market. The result is that CAA gets the bad lots, and sometimes it costs through high depreciation charges."

CAA's safety agents cannot examine and check for every item before they issue export certificates, says Wells. An



## Army Secretary Files In Fairchild C-123



Secretary of the Army Robert T. Stevens has purchased a new aircraft for the Army. The aircraft is a Fairchild C-123, a twin-engine propeller aircraft. The aircraft is being used for transport and cargo. The aircraft is being used for transport and cargo.

agent called into a repair station and then a member of overhauled engine may make a spot check, but he cannot be positive over, part 1, item 1.

Member of House, F. C. Schlegel, CAA's international regime conference sponsor, has a "theory of hazard" that includes a large packing case full of faulty parts taken from "overhauled" engines and is only a French conceit. Schlegel and his agents have been called all over the world to inspect shoddy goods brought from U.S. airlines. There are none, Schlegel says, where the blame must be shared by the purchaser, who fails to inspect properly before by a competent agent.

CAA says such nonconformity control is slipped without an expert certificate of acceptance. Efforts to force foreign buyers from this country have not been successful.

● **Billion Dollars Business**—Repeatable items, pointing out that the sale of used aircraft parts has become an annual multi-billion dollar business, report new methods of repair and overhaul material will be available in the near future.

It is estimated that large quantities, without an established name and factory brand to protect, account for one-fifth of the used parts market. These items offer goods at a lower price than the recognized dealer without payment of credits.

● **Approval Authority**—Under the second procedure manual on "Export and Import of Aircraft Parts," CAA will continue to approve exports by issuing a certificate (Form CAA 26). However, often may come for airworthiness.

CAA's standards on their own products (new or used), along with accessories, parts and components. The manual items must be operating under a certificate of air held department authority.

● **Inspection Stations**—Continually released to private experts, on products for which they are not under CAA certificate.

Representatives make it clear that these items will be required to be definitely recognized by the manufacturer and representative of the manufacturer and representative of the manufacturer.

● **Reliable Standards**—CAA's action follows efforts by many major suppliers to set up reliable standards.

For example, the Babb Co., large dealer in surplus equipment, organized its own "surplus quality" program. Its major effort was to eliminate a list of more than 10 defects in the inventory applied to aircraft components.

These substituted four disqualification new certified, untested certified, untested certified and used untested certified.

CAA certification is added to all four classes for aircraft equipment.

## AIA Asks \$500 Million for Tools

Panel says aircraft industry must have new machines to meet high-speed demands of emergency production.

Los Angeles—Some \$500 million in new machine tooling is necessary to modernize the aircraft industry at the point where it will be prepared for emergency production, reports the Machine Tool Panel of Aircraft Industries Association last year study.

Equipment is plentiful and in the machine tool industry is inadequate for today's requirements, the panel says. Production of high-speed aircraft requires tooling much more modern than that now in use.

The panel, including representatives from each of the major aircraft plants, has drawn up specifications for these and, in some cases, more information machines. The group is not yet in final agreement with the machine tool manufacturers on many of these specifications.

It will meet with the machine tool builders next month to reach the final decision on this new study of air craft.

● **Technological Revolution**—Among changes the panel is urging, according to chairman W. E. Bennett, member to the new production manufacturing at Hughes Aircraft Co., are:

- Reduction in the large number of machine tools;
- Increased range of loads, speeds and horsepower more adaptable to materials now used in aircraft;
- Greater adjustment of design capabilities;
- Lower adjustment cost rate of parts.

The aircraft industry thus is leading a technological revolution that will speed its other industries in the tooling becomes available. Bennett believes.

The new tool required are within the known methods of solving horsepower, bearing and other problems, the panel reports.

"We are not talking about unknown methods," Bennett says. "We have avoided that. It is a question of design, not research."

● **Emergency Expansion**—War-time production of such a bomber as the B-29 would require such an expansion in tooling for manufacturing of new forged parts that it might well take the entire year to build the tooling, the panel estimates.

The time to understand tooling so that it can handle any emergency expansion adequately is now, Bennett reports.

will be for additional tools to build new aircraft, not to replace present tools.

● **Complex Methods**—Most of the present tooling is of early World War II vintage and needs replacement with tools that can work with the complex methods, and never intended. Being used in new aircraft.

An example of some of the new types of tooling the industry is recommending, he cites new bed-type tools that will cut in less than three minutes one due to their high-speed and spindle speed, feeding machines with 500-hp. feeds with depth control and level that can such surface parallel to the machine's axis and a constant rate of feed.

"Combination of two or more control machines is one thing the industry has rarely needed," Bennett says. "This type of machine will really throw its weight around in the aircraft industry."

● **Designs**—The Machine Tool Panel was set up by the Manufacturing Methods Committee of AIA in 1951, when it became apparent that the increased complexity, weight and performance of aircraft was going to require the use of a widely larger quantity of machine tools of a type not previously used in the aircraft industry.

High-speed aerodynamics was demanding faster and stiffer sections. New materials, alloys and complex configurations were posing difficult machining problems.

Machine tools developed around manual industrial equipment for common, domestic tasks proved inadequate in power, speed and feed ranges to meet the demands of new designs and alloys.

A preliminary investigation by the panel showed urgent study was needed in the field of general purpose and horizontal boring mills, slot and spindles, grinding and finishing equipment to bring them up to standards required in the aircraft industry.

Each year the member studied the problems in his own plant. At later meetings of the full panel, these were compared and the specifications now being set forth by the group were drawn up.

● **Versatility**—One of the prime advantages of the new type of machine tools, which they call versatility. They will be of particular appeal to the aircraft industry, whose machines will enable him to take on a wider range of jobs.

A comparison of the new specifications will be issued by the panel early next year.

Department of Defense and the Office of Defense Mobilization, which is studying the coordinated program being carried out by the aircraft and machine tooling industries, anticipating its technical effort upon the machine tooling and recovery program of the military services.

Success of the program has been such that efforts will need to be extended to a study of financing and stockpiling equipment, AIA reports.

## White House Action Delays Airline Strike

A strike by the International Association of Machinists (IAM) against its airport unions has been delayed at least 60 days by White House appointment of an emergency board to investigate the dispute.

Under the President's last action, the machinists were scheduled to strike last week against Capital National, Northwest, Trans World, United and Eastern Air Lines. The strike would have affected 23,000 routes nationwide.

The machinist contract with the airlines has been under negotiation since last May. In October, the National Machinists Board made an unsuccessful attempt to get the dispute submitted to arbitration.

President Eisenhower appointed the board under the authority of the Railway Labor Act, finding the dispute "in the judgment of the National Mediation Board threatens substantially to interrupt interstate commerce to a degree such as to deprive a section of the country of essential transportation service."

Under the terms of the Railway Labor Act, the board has 60 days to report its findings to the President, and there can be no strike for an additional 30 days after the board reports.

A new integrated statement of "new" deemed to make it more likely to be, high-speed aircraft under RFR conditions and to simplify cockpit instrument panel, has been announced by Sperry Corporation Co.

Final installation of the Sperry dash-board will be made in Pan American World Airways' fleet of Douglas DC-7Cs as part of an improved version of the Sperry A-12 instrument.

The system consists of three new panel instruments designed to give the pilot added information in a more personal form.

As added feature is a Zero Reader light detector incorporated into the "base of" panel instruments. The new light detector includes:

- A continuous horizon and Zero Reader indicators, which give the pilot position and bank attitudes plus light detector steering instructions.
- A horizon deviation indicator, replicating the ILS panel instrument. This display presents the plane's position relative to a new, Volpe location or VOR beam, magnetic heading and the ILS glide slope.
- A radio altitude indicator (RAI), showing the aircraft's magnetic heading.

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## New Sperry System To Simplify Cockpits

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and the VOR or ADF bearing is two stations.

## ARB Chief Scores British Copter Lag

London—Lack of progress in development of British helicopter engine as far as ship criticism in a major debate in the House of Lords with Lord Strathclyde of Bow, chairman of the Air Registration Board, leading the attack.

Lord Strathclyde and the U.S. not only is "well ahead of us, but we are very active in development and production."

● **Long Overdue**—"I am sure there have been a great advance of the British engine industry," the ARB chief, "but I maintain that on this subject a large waste of time and money is being incurred."

He was joined by several others in challenging the government's position on copter development. British Royal Air Force chairman, Lord Dunsley of Kirkcaldy, commented that he was not at all optimistic about the present progress in development of helicopter in this country.

● **Household Name**—Lord Macmillan, government spokesman, pointed to the work being done on the Bristol 173, the Puma helicopter and the Westland Wessex helicopter. He said military orders have been placed for "about 100 Pumas and 100 Wessexes" in the past year.

● **Radio Altitude Indicator (RAI)**, showing the aircraft's magnetic heading.

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Taylorcraft Produces Plastic-Covered Planes

Random Fiberglass plastic is extensively used in these new models of light aircraft as the production line at Taylorcraft, Inc., in Greenville, Pa. First of its new type is shown getting set for a flight test. The keel is made of two plastic sheets joined over a tubular structure, the wing ducts over a girder and aluminum framework. In addition, plastic is used for the seats, doors, fuel tanks, wheel pants, engine cover,

instrument panel and other components. Helium gas and electricity are used to bond the Fiberglass and aluminum sections. C. J. Conway, Inc. First of its new type is shown getting set for a flight test. The keel is made of two plastic sheets joined over a tubular structure, the wing ducts over a girder and aluminum framework. In addition, plastic is used for the seats, doors, fuel tanks, wheel pants, engine cover,

AVIATION WEEK, November 22, 1964

down on size. I would prefer to develop this layout."

In a discussion on the advance results of new U. S. large engines with the S-6 and the P-100, Lt. Col. Mervyn Clark, speaking for the government, stressed those types were some time off being used commercially.

WPA's Lord Douglas observed: "At least those two aircraft are being used. The Juicer (Ju-87) will not be in the air for another two or three years."

## 15 Aircraft Firms Win Tax Writeoffs

Office of Defense Mobilization reports a 15-firm reduction of tax on research and development facilities by Lockheed Aircraft Corp.'s Missile Systems Division were the largest reduction project approved for the Oct. 21-Nov. 3 period.

ODM afterward accelerated its research benefits at 60% of the project under its program to stimulate private expenses of defense facilities.

Accelerated tax expenditures on 60% of an \$35,000 expansion at the same plant for exclusive production also was approved.

Other categories of necessity and percentage allowed for associated tax subtraction included:

**Armstrong Corporation Co.**, 25,000 of the General Corp. Tax Assets (Missile) aircraft components \$10,000 credited with 60% allowed.

**Boeing Aircraft Co.**, 10,000 of the General Corp. Tax Assets (Missile) aircraft components \$10,000 credited with 60% allowed.

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## Prototype Caravelle Need \$7.8 Million

(McGraw-Hill World News)

Paris—The French Parliament has been asked to appropriate approximately \$7.8 million for completion of the two prototypes of France's first jet transport, the supersonic Caravelle.

Request was included in the 1955 civil aviation budget submitted by Jacques Chaban Delmas, Public Works and Transportation Minister.

The S.E. 210 Caravelle is designed to carry 78 passengers. Its maximum range will be 2,100 mi. with a planned speed of 470 mph. Its distinctive design features is the location of the two Rolls-Royce Avon R. A. 16 engines far back on the fuselage.

Other data is on the Caravelle page 115. Its length 103 ft., weight fully

equipped 11,900 lb., maximum payload 11,200 lb. Planned payload based on 6,000 ft. runway will be 15,400 lb. over maximum distance of 1,590 mi.

The two prototype Caravelles now are being constructed by the Société Nationale de Construction Aéronautique du Sud-Est (Socan) in cooperation with the Socma (Sud-Ouest). It is expected that they will be completed by the end of February, that first flights will be made in May or June.

## GE Says Turbines Best for Copters

Fuel economy, lower noise level, durability and reliability were listed as major advantages of turbine engines for helicopters by H. T. Holman of the General Electric Co., manager of that company's T38 project to produce a turboshaft engine using engine for the U. S. Navy.

Holman told a Washington meeting of the American Helicopter Society that gas turbines will give copters twice the power they can get out of piston engines of comparable weight.

First cost, he said, has not been a primary consideration in turbine power plants for combat airplanes but must be kept down for use in helicopters. He predicted that a turbine can be made that will not cost more in dollars per horsepower than competing piston engines.

Holman told the group that use of turbines also will cut fuel costs, reduce size and give better performance.

## Small Firms Get 21% Of AF Subcontracts

The percentage of Air Force procurement dollars passed along to small business by major prime contractors was about 21% in both fiscal 1953 and 1954, Kenneth Wadell, chief of the Office of Small Business at USAF headquarters, reports.

Wadell says that in 1953 large prime contractors got a total loan sum of \$13,799,544,680 and passed along 51% of the money in all kinds of subcontracting.

The class of small business firms, those requiring fewer than 500 persons, was \$2,856,985,000 or 21%.

In fiscal 1954 the large prime contractors received orders worth \$5,185,797,900 from the Air Material Command, and again about 21%, or \$1,078,800,000, of this eventually went to small business.

Wadell says there was no evidence that the percentage of total dollars going to small business had changed.

This statement was issued to correct figures appearing in Aviation Week (Oct. 18, p. 27).



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## Ford Ships First Afterburner J57 Jet

A dozen engines, destined to shoulder part about cover the length of the first J57 turbojet with afterburner produced by Ford Motor Co.'s Aircraft Division, Chicago. The company, building the new model under Pratt & Whitney Aircraft license, and the first engine, designated J57-P7, is North American

Aircraft, Inc., for production in the F-100 Super Sabre. Its last production J57 was delivered last April after making for more than 16 months. Ford has USAF contracts for the 16,000 third-class jet subassembly since 1957. It previously delivered 3,077 P-6 WAs. P-6 WAs made under license.

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## Picket Planes: Offense, Defense Threat

By William J. Connelley

Bombards, T. H.—Navy and Air Force crews now are putting WV-2s and RC-121s into operational use as the Pacific, developing new concepts in the use of radar for airborne offense and defense.

The planes are military versions of Lockheed Aircraft Corp.'s Super Constellation transport, bulging with the odd-shaped radars that control air masses for search and height-finding radar.

USAF and Navy have concentrated on development of different tactical status of those flying radar stations. In general, it might be said Air Force can planes has been on offensive capabilities of the aircraft, while the Navy has been more interested in its defensive uses.

► **Operational**—Squadron—Lieutenant William staff members recently logged more than 10 hr flying with Air Force and Navy operational squadrons in California and Hawaii to study their post World War II radar development.

USAF RC-121Cs and RC-121Ds are assigned to the new 5th Air Division at McClellan Air Force Base, near Sacramento, Calif. Part of the Navy's WV-2s recently were delivered to Air Force. Early Warning Squadron 1 (VW-1) at Barber's Point Naval Air Station, Oahu, Hawaii.

Eventually, both Air Force and Navy will operate similar units in the Atlantic area.

Differences between the USAF and Navy versions of the radar planes are minor.

► **Casualty Counter**—The radar Super Constellation probably is the most distinctive craft in the air.

Height-finding radar antennas mount 5 ft from the top of the fuselage in a narrow nacelle. A searchlight is mounted in a large bulbous radome swelling grotesquely from the underside of the fuselage. This results in the jagged appearance that has given the plane the nickname of "Casualty Counter."

Inside the plane, the dim interior of the searchlight radar section, packed with more than six tons of electronic gear, gives the impression of the interior of a submarine rather than an aircraft. Both sides of the aisle of this main cabin are lined with radar consoles, each with a comfortable swivel chair in front of the traps.

► **Driving**—Tracking—The orange, blue and green lines on these radar scopes, pulsating in the semi darkness, can perform operations that sense the transmitted.

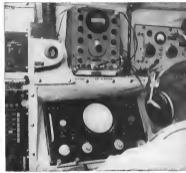
The experienced radar operators can



**SUPER CONSTELLATION WV-2** peers over USS Kearsarge, which holds plane steady for "casualty"



**COMBAT INFORMATION CENTER** aboard WV-2 plots radar contacts, will direct defenses



**RADAR SCOPE** at one station. Scope (bottom) registers range and bearing of target

track other aircraft, determining speed, height and distance. They can follow ships, detect submarines, analyze weather, track and control attacks.

Electronic equipment can determine intercept courses for aircraft flying at different speeds in different directions. Height-finding radar can zero in on any of many targets in the air.

Scope patterns can be relayed via television to other aircraft, to ground vehicles or to ships. Electronic countermeasures devices can jam enemy radar.

#### Offense Mission

One of VW-2's first operational missions with its new radar plane demon-

strated the offensive use to which these flying radar stations can be put by the Navy.

VW-2, under Capt. Adams II Perry, was given the task of locating the "sonar" cruiser Kearsarge as the waters off Hawaii and detecting offensive strikes against it.

The squadron was to devise the strike tactics and control the waves of striking aircraft that were to test the defense capability of the carrier against this type of airborne-derived attack.

► **Coupler Task.**—The 31-man crew of the WV-2 was told at briefing that the carrier's last known position was somewhere south of Oahu.

The first job ahead of them in the big radar plane lifted off the runway at Barber's Point is the periscope duty: men was to locate the carrier on their radar screen, while at the same time staying out of range of the carrier's own radar. The carrier's defensive air patrol could score a quick "kill" on the unarmed Super Corsair if its position were discovered.

Once the carrier was spotted, there began the complex task of directing the fighter strikes against it. Radio gear of the Super Corsair would enable the crew of the WV-2 to track the carrier's combat air patrol and vector their own planes into the ship on a path that would avoid interception by those of the carrier during the attack.

► **Shaking Station.**—Land-based Marine F4Bs and F6Fs from Kaneohe Naval Air Station, guided by the electronic eyes and beeps of the ceiling WV-2, struck across the Kearsarge, concentrated at an altitude of 1,000 ft. in an attack from the east. Seconds later, F2V's roared over from the west.

As the first two waves struck the Kearsarge, a third wave was passing the carrier's own radar gun in it up positioned from the north. This attack consisted of four TBMs engaged in precise passing with cliff and two specially equipped AD Skyraiders accurately passing electronically. This wave also hit the carrier unintercepted.

The WV-2 then vectored its striking aircraft back to their land bases for refueling to its own field.

► **Split-second Timing.**—It was a continuous demonstration of the split-second timing work which the flying electronic instrument could direct air war in the future. It all took place in the daily life cabin of the Super Corsair, with the man watching and guiding the action through their radar scopes and radio controls while standing out of range of the carrier.

When the pilots, navigators, flight engineers, radar controllers, radio and TV operators, electronic countermeasures officers and maintenance specialists filed out of the aircraft after its return to Barber's Point, Muskogee on the brightness of the early morning Hawaiian sunlight, they had not seen the carrier or any of the success involved except as tiny blips on their radar.

Yet there, the battle they were directing had appeared only as flickering points of light in the darkness of the WV-2's main cabin.

#### Navy Radar Aircraft

The history of the Navy's radar air craft is long but impressive, as reported by Lt. Cmdr. Alex Willard, assistant to command center officer of VW-2.

It originated from the use of shipboard radar, with the first shipboard



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and new and improved products are constantly being developed.

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combat information center established at the Eisenhower Center in 1941.

Under the Network was during the attack on the Japanese-held Midway Island, the radar that the need for airborne radar had become apparent.

Japanese torpedos bombers, flying low on the water, hit the carrier undetected by the radar.

"When everything opened up," Wilkins remembers, "we started to get the reports and then shooting down torpedos bombers. We yelled, 'They're shooting down our ship, they're shooting down our ship.' There we are, the members. We pulled back to our radar to use of the operators had been wrong. But the radar had failed to pick the target up because they had come in on the water under the radar. Fortunately the lapa didn't notice what they had done and it was not reported."

■CIC Concept—Radar proved its true value in the First Battle of the Philippine Sea when that wave, of 113 Japanese planes, were shot down on intercepts directed by the combat information center. None of the attacking aircraft reached the carrier.

After that, the Navy began to delegate more control responsibility to the combat information center, in the form of a concept that now is being fully developed with the WV-2.

An U.S. fleet moved closer to Japan in their advance across the Pacific, the Japanese believed for the first time their planes could come in under daylight radar.

The Navy then began a "crash" program to develop airborne radar to see how this low altitude radar. First test was with an APS-20 radar unit in a TB-34 of Case Man. N. J.

■Airborne CIC—Meanwhile, radar officers were working for an aircraft not limited to ocean detection. They believed it also should be a complete airborne CIC to handle control functions direct aircraft warfare and fill a multi role of other uses.

The result was a full Navy program for the development of airborne radar. Although the program was slowed from the program by the end of the war, VN-4 was activated as an airborne radar unit in the Navy's Operational Development Force. While its development was not as good as hoped, VN-4 discovered its radar was extremely effective against incoming submarines.

It was this first first converted the Navy it should give full backing to the program.

■First Squadron—Airborne Early Warning Squadron 1 was established in 1945 at Reno Field, San Diego, Calif., and in June 1957 was shifted to the Navyman with the PB-1W patrol aircraft.

It has been trained with the WV-1, an earlier model of the WV-2 and to

operate Navy's airborne radar techniques during the past three years.

In maneuvers in the Western Pacific in 1954 in which more than 200 ships took part, WV-1 was permitted to detect a submarine in the development of an tactics employing airborne radar.

"For the first time," says Wilkins, "the task force commander had complete knowledge of what was going on in the air and on the sea around him."

Since then, he says, WV-1 has had most requests that it can handle to work with current, sophisticated tactics, resources and resources from.

In addition to its autonomous warfare use, it also should be noted that

the WV-2 can operate offensively with submarines, positioning them for attack by tracking both ships and submarines on its radar scope.

■Cooling Concept—The doctrine of control and coordination from the air still is being developed. The WV is an operator independently or in a team with CIC units, either shipboard or airborne.

Eventually, the members of WV-1 believe, control and coordination of fleet operations may take place entirely from some flying radar station.

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## Air Force Tests

- USAF then has expressed interest in the RC-121 for two reasons.
- Its capability as a high-altitude radar picket plane to be used for spotting enemy aircraft as they approach the U.S., long before they are within range of ground radar systems.
- Its effectiveness as a light control center for other defense or offensive operations.

► Limited GCI-During the Korean war, radar deficiencies limited the effectiveness of Air Force GCI (ground-controlled intercept) operations in the MGO. After fighting, USAF thought the Navy developed airborne radar might provide an answer to the problem.

A series of tests was run in the U.S., with Air Force jets making simulated strikes at a Navy radar plane. Early strikes were detected and intercepted under the direction of the airborne radar while jets still were at least 25 mi from the Navy aircraft.

Air Force, meanwhile, is producing a combat for the radar plane in August 1955 (Aviation Week Aug. 24, 1953, p. 17).

► U.S. Pocket Lanes—One of the prin-

cipal reasons the Air Force has an interest for its RC-121Cs and RC-121Ds (the Do are equipped with empty tanks for greater range) is that of maintaining an around-the-clock airborne patrol of the approaches to the continental U.S. This will begin when the radar planes are available in sufficient numbers.

The 1st Air Division, activated last May under the command of Brig. Gen. Kenneth H. Graham, will have about 2,500 officers and airmen on both coasts when it is fully operational and will be equipped with 10 aircraft per squadron.

The men of the 47th Air Force Early Warning and Control Squadron at Malmstrom, Montana, are using their aircraft in a combination training and operational program.

► Airborne Station—The radar picket planes will be used to extend the Air Force Ground Detection Zone out to sea. Long range endurance of the RC-121 will enable the aircraft to remain aloft on patrol for more than 24 hr. without refueling.

If this happens in Air Force use an airborne radar search system and lighter weight radar control center with other similar to those of land stations.

In fact, if carrier action should put a ground station out of commission, one of the Army radar systems could be moved by ship to the area to fulfill the same function.

► Radar Picket—A light is one of the 5th Air Division aircraft indicates that might happen if one of the RC-121s is detected on unidentified ship while patrolling in sector of the coast. Each sector is designated a "lane."

One difference between Air Force and Navy versions of the aircraft is indicated in a board in the back of the plane and the radar observer manning the search sets in the USAF aircraft are called "lanes." In the Navy they are officers, indicating the greater emphasis on control facilities.

The jets in the RC-121s used to direct fighter planes on intercept missions are manned by Air Force officers trained as intercept directors.

A search director sits at a radar control board from which he is able to communicate with intercept aircraft in the area, set up priorities for use of the height finding radar and monitor any reports in the plane.

Upon sighting of an unidentified ship, the radar operator passes the information to the plotter, who fixes its position on a geographical grid and relays this data to a helix, who takes the position to control radar.

If the target cannot be identified as friendly, interceptors are scrambled and ordered to escort the unidentified aircraft. The intercept director can plan his radar to guide the interceptors to the unidentified aircraft.

Meanwhile, other sets can track de-

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Don't depend upon your own old propeller ideas to clear your wings of snow. Snow day, jewelry snow may have melted and returns underneath on the wing.



On the ground, get your plane into a hangar on cold, rainy days. A quick drop to near 32° F. will cause rain to freeze on impact with the wings.



Under an overcast sky in light rain with temperatures near 32° F., freezing rain is apt to be encountered. If not equipped for all weather flying, land immediately. If this is not possible, try climbing to warmer temperatures in the surrounding area clouds.

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 Long, Howard-Sprent, jetcraft's arm made aboard the KC-121s and WV-2s for conflict of the crew during long hours in the air. These include beds for relief crews, a galley with grids, a re-

frigerator and running water.  
 The aircraft is powered by 10,000-hp turbojets at 25,000 ft. Speed is about 500 mph, although cruising usually is much slower.  
 Dimensions are those of the basic Lockheed Super Constellation: 123-ft wingspan and 116-ft length. Engines are the same as those of the Super Constellation: four Wright 3,250-hp Turbo Compounds.



FLOATING HELIPORT, being tested by Bell 47D-1 copier, costs only \$5 a foot to install.

## Heli-Float Passes Landing Tests

Phoenix, Ariz.—The Heli-Float, a new type heliport designed to make routine landings possible without expensive building changes, was demonstrated here last week.  
 The Heli-Float employs the basic principle of hydrostatic pressure—its distribution of weight through water. It is the result of a three-year research and development program by Alex C. Thomson of Thomson Research Co., New Ark.

A full 47D-1 helicopter made several test landings on the Heli-Float atop the four-story Illinois' building in downtown Phoenix.  
 • Skid-mounted—Used on ice, most heliports often have involved expensive structural changes. Only change to the test dock, which has normal strutting of about 40 lb per square inch, was construction of a low wall wooden tank capable of holding the maximum of 2 in. of water.  
 The float measures 11 by 16 ft., and the tank is slightly larger. Complete installation weighs 900 lb.  
 The model float is 3/8 in. thick and is buoyantly designed to support

16,000-lb per square foot, placed on bottom and top. Structures beneath it is a good deal of floor products Co., Oakland, Calif.  
 • Helicopter—Thomson says platform can be made to handle the heaviest helicopters. "Theoretical platform sizes will be necessary," he adds, "and this will distribute the apparent weight of both platform and helicopter over a greater area safely."  
 Features of the Heli-Float:  
 • Easy installation on large or small flat-roofed buildings. A 50-ft. square would be adequate for a single machine, while the larger Heli-Floats would extend several hundred feet.  
 • Frequent barrier between the Heli-Float and the building.  
 • Noise absorption by the float and the liquid, ensuring a quiet interior.  
 • Light weight. A 100 by 200-ft. plot form would weigh 1,400 tons in place, compared with 50 tons in the building.  
 • Economy. Thomson estimates that in full production a Heli-Float can be installed at \$5 a foot, compared with \$22 for a typical concrete installation.

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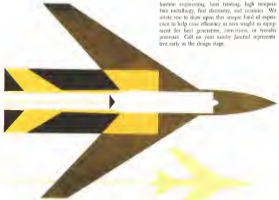
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## BONUS THRUST: NO PENALTIES



The addition of extra thrust to a new jet engine with a combustion device weighing only six pounds is one of today's unique engineering achievements—the result of successful collaboration between Janitrol and gas turbine manufacturers.

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This development is a concrete example of Janitrol's many "firsts" which include the working flame burner, the refractive tube heating principle—hot rod wigg, anti-slag—perfect gas generation—compressor seal regulation—and the double plate construction of heat exchangers. The background necessary for these achievements has not been acquired overnight. Rather, it goes back over 37 years and spans many fields of combustion engineering, heat treating, high temperature metallurgy, fuel chemistry, and economics. We invite you to draw upon this unique field of experience to help ease efficiency or save weight in equipment for heat generation, conversion, or transfer processes. Call on your nearby Janitrol agents free only in the design stage.

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## AMC, ARDC Officers Win New Promotions

Air Materiel Command and Air Research and Development Command officers signed prominently in a list of recent appointments to major and permanent ranks of major general and lieutenant general, announced by the White House.

Promoted to permanent major general and Samuel R. Rasmussen, assistant chief of staff for guided missiles, Donald L. Furr, deputy chief of staff for development. William H. Turner, commander of USAF and Albert Reed, commander of Wright Air Development Center.

To temporary major general Merrill D. Bernick, deputy director of AMC for maintenance equipment. William T. Baker, commander of the Sacramento AMB, Stuart F. Wright, commander of Rome Air Development Center, Frederick J. Day, AMC director of supply and stores and Samuel B. Harris, Jr., commander of Arnold Engineering Development Center.

Gene Hefley, Wright and Day also were named to the permanent rank of lieutenant general. Others given this grade included Floyd B. Wood, ARDC deputy commander for technical operations. Theodor C. Odum, commander of the San Antonio AMB, Lee B. Walsh, major general and Roy Swank, former chief of public relations and now commander of the Pacific Air Force.

Promoted to temporary rank of brigadier general: Tim W. Scott, AMC deputy director for supply & services; Arthur F. Sternfeldt, commander of Rome Air Force Depot, Donald D. Flanagan, ARDC director of research, and Don B. Ormiston, ARDC director of development.

## BOAC Credit Plan

British Overseas Airways Corp. took part in the upcoming jet-liner maneuvers, now in effect, a combined plan in cooperation with British Overseas Airways for the delivery of aircraft payments in Britain for fuel throughout the world.

BOAC's regional jet-liner plan, introduced Nov. 1, was available only for travel in the U.S.

The BOAC-BFA plan is similar to those of other airlines. 10% down payment.

Minimum payment period is six months if the balance is under \$54, 22 months if \$54 or more but under \$250, and 21 months if the balance is \$250 or more.

However, the credit plan does not apply for any balance coming from the U.S.

## Cutler-Hammer

## Sealed Lever Switches

## for Aircraft

Another contribution to aviation progress by the engineers with a record of "firsts" in electrical control for aircraft

For 30 years Cutler-Hammer has been the major supplier of electrical control equipment designed exclusively for aircraft use. As aircraft progress revealed the need for better control, Cutler-Hammer has continuously pioneered in the designs that have established the industry's standards. And now Cutler-Hammer leads again... with the first complete line of sealed lever aircraft switches. Designed to prevent the entrance of dust and sand, they are equally effective in stopping the entry of water even during periods of switch operation. With a durable plastic seal, these switches meet all requirements of MIL-E-8745 and/or JAN-E-525... and, in addition, meet the seal and dust requirements specified under Procedure 1 of MIL-E-8275. These switches also meet the recommendations made in the "Report of Advisory Staff for Aircraft Electrical Systems." For complete data, write for your copy of Publication KSP-35 CUTLER-HAMMER, Inc., 1472 St. Paul Avenue, Milwaukee 1, Wisconsin.

### Typical Cutler-Hammer Sealed Lever Aircraft Switches



### What you should know about Cutler-Hammer

Cutler-Hammer has been held the respect of the aircraft industry because this company has been part of the aircraft industry for 30 years. It has shown time and again as an important supplier. It has pioneered the development of all competitive activity in manufacturing and long-range planning. It has supplied complete lines of equipment, and among the firms of which you will find great table manufacturing. Today, as for the decades past, Cutler-Hammer is a leader in the aircraft industry in the design, engineering, and building for the future. Here is the record:

- 1918 Cutler-Hammer designed and manufactured the first line of switches ever created specifically for use in aircraft.
- 1919 Cutler-Hammer designed and manufactured the first of a power relay ever created specifically for use in aircraft.
- 1920 Cutler-Hammer started development of the first automatic fire power relay for use in aircraft.
- 1925 Cutler-Hammer introduced a single and dual line relay on the first harmonically sealed power relay to AEC and the first Cutler-Hammer combination adopted as industry standard by AEC.



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## AERONAUTICAL ENGINEERING



THEY MADE A LAST OUT OF THE F-89. That's one of the successes achieved by Northrop Aircraft's revamped technical team.

### How Should Engineers Staff Be Organized?

## Northrop Banks on Combination Setup

• Management aims for strength of a project-type approach plus versatility inherent in group system.

By David A. Anderson

Hawthorne, Calif.—A different concept in engineering organization is gaining Northrop Aircraft, Inc.'s drive to give new results for its wide variety of aircraft and associated work.

Reorganized about two years ago, the Northrop engineering staff now numbers about 3,000—combines the strength of a project-type organization with the versatility found in a group system.

With many specialists in the newer technologies of the control and weapons systems added to a group with long experience in many types of aircraft designs, the Northrop engineering wing—specialized both capable of handling any aircraft problem requiring a solution that lies in the aircraft.

► **Project List**—Northrop engineers work on a large number of projects, from small ruggedized rockets through large language facilities to heavy and complex all-weather interceptors. They work in weapons, optics, guidance and ordnance.

They have expanded and strengthened the aging F-89 Scorpion to the



MORE RANGE, MORE PUNCH COMING—F-89D is not the last, says Northrop.

point where her accident record is one of the best in the USAF, and has performance at altitude almost unbeatable.

They have developed the X-42 Swift, language problem solver for the Air Force, and can design "an-outrageous program" for the missile, an outboard in a field where progress is all too slow.

Coming up, say reports, are a new lightweight fighter, more stretch in the F-89, a new heavyweight language interceptor and an advanced version of the Hawk.

► **Leadership**—In charge of organizing at the vice-presidential level is Edgar Schenck, whose previous experience included spearheading the design of the Mustang and Sabre while at North American Aviation, Inc.

Under Schenck is chief engineer Dr.

William F. Bellows, with preponderant design experience at Convair and Douglas-Ki Seguros under his belt.

Schenck and Bellows told Aviation Week some of their ideas on the way to organize and manage an engineering department.

"Our goal is a high-speed, low-cost department," says Bellows. "We want to attract good talent, work them hard and pay them well. We can get more work out of two good high-speed men than out of three or four lower skilled, inferior engineers."

"That would give us the smallest engineering department to do the job," added Schenck. "Then we must develop the most efficient organization to use those men."

Schenck and Bellows mention a department organization combining the trends of the so-called "series" or

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AWARDING THE 1967—Edgar Schenck, Jr., vice president in charge of engineering, and Dr. William F. Sullivan, chief engineer, use Northrop's computerized engineering tool.



project type, and the "horizontal" as group type.

► **Engineering**—In typical project organizations, there is a project engineer in overall coordination. Under him is his sub-specialties of aerodynamics, structures, avionics, mechanical design and other groups. Each of his sub-specialties works on the specific project only.

In contrast, the group organization divides the working force into seven divisions, structures, avionics and other working teams, and feeds all project work into these groups. A man in a group organization may work on one type of work, such as flutter analysis, but he will do it on all the projects.

Schenck would like to combine the two ideas, even in the layout of his new engineering building. There won't be any formal grouping of design or project teams in inside offices.

"In effect, says Schenck, we will put everybody into one large room. If I want to check the state of the art in general design, I walk across the room. If I want to determine the status of a particular project, I walk up and down the rows of desks and tables."

► **What to Do**—"We only want to work on projects that have a direct bearing on products," said Schenck. "We believe that pure research contracts belong in universities."

"We are experience-heavy in people who know fire control and weapons, including things that shoot," Schenck added. "For example, we are doing many specific studies of weapons systems in small areas with great detail. This complements the work done by people like the Rand Corp., who make general studies in large areas with little detail."

We think we have the best people for weapons systems," said Sullivan. "Northrop has done a lot of work on specific designs of fighters and other systems. We do this to find out the needs of the Air Force, and to help us design weapons to fit these needs."

► **Missile Work**—One of these needs is the long-range Sprint. Nine years of labor on this missile booster are beginning to pay off in test flights at the Air Force Missile Test Center, Gotha, Fla., where the big birds have been carving out space for many months.

Another Sprint AF need is a long range intercepter, not a local defense plane, but something with enough range to deliver the enemy before he gets near the defense perimeter. To



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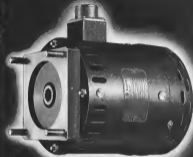
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**JET ENGINE DIFFUSER CONE**... produced by SOLAR AIRCRAFT COMPANY, San Diego, Calif., for use as J44 jet engine. Made from 18-8 columbium-stabilized stainless steel (AMS 5531) this casting replaced forgings and resulted in greater economy plus superior dimensional stability of the part after machining. Dimensions: 24 in. x Weight: 200 lbs.

**NOZZLE DIAPHRAGM**... used in aircraft engines at temperatures up to 1500°F. Produced by LEBANON STEEL FOUNDRY, Lebanon, Pa., this part is cast in chromium-nickel stainless steel (CF 8C alloy, approximately equivalent to Type 347 wrought material).

**JET ENGINE BENDS**... centrifugally cast by the INCHALLOY COMPANY, Bensenville, Ill., using 28% chromium-14% nickel-3% tungsten alloy. The casting is a rough machined blank. The end castings are finished rough. These parts are used at temperatures of 600-700°F., under highly oxidizing conditions. Dimensions: about 12 in.

**THE INTERNATIONAL NICKEL COMPANY, INC.** 67 WALL STREET NEW YORK 5, N. Y.

dry that job is being done by the much-maligned F-89 Scorpions.

"What did you do to make the F-89 a lady?" Avonius. Weiss, after Schenck, who came right back with, "She's not a lady, she's a workhorse." His comment started a whole string of yawns for the Scorpions.

"The F-89 is the only plane in the universe that will do the long-range interception job, even though she's 10 years old.... She's slow to get away, but after you get above 10 or 20,000 ft, she'll outclimb the others."

I heard she took on an F-86 and 1 F-4C and beat those buns to 40,000 ft.... When spending money now to get some more stretch out of her. She is not at her aerodynamic ceiling yet, so it's pretty obvious that we've got to add some power and we'll get up altitude and some knots at best maneuvering speed."

► **F-89 Redesign**—Ballhaus said the test flying program on the Scorpion after its groundings was one of the few cases where such extensive work had been done. Northrop engineers examined a Scorpion, flew it for hours getting the flight loads in all conditions of flight. "Then data was fed back into the redesigns of the basic structure."

"There was a complete revision of structural qualities to meet flight loads," added Schenck.

That redesign and the subsequent modification took a year and a half, and was done with no fee to Northrop. But it has paid off in more wins. Pilots love the airplane, she can do the job, and there's much to grow on.

► **Where Test-Northrop**, like other firms with experienced engineering teams, is looking ahead to projects that will cut the role of its designers.

"The technical competence of our engineering staff is equal to anybody's," said Ballhaus. "Just to show you. We had a new project and the Air Force wanted it in six weeks or a better. We thought we could do the job in one year, but everybody told us we were crazy. We talked to the Air Force and convinced them that they ought to let us try."

"They had faith and they gave us pretty much of a free hand. We did the job within the year we had set."

Northrop is looking into transport work, too, with working to make sure. John Adams, vice president for administration, told Avonius Weiss that the company was studying the carrier transport, but only as a start-up of engine integration of the joint market. "If you don't keep looking around," said Weiss, "you are lost business. Don't expect us to start building transport tomorrow, though."

► **Transport Study**—Another Northrop

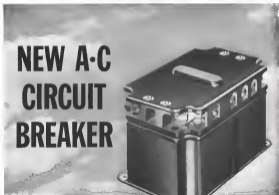
venture, T V Jones, deputy chief engineer, presented a consideration of a detailed study in air logistics at the recent SAE national symposium on air in Los Angeles. Jones worked on the study with members of the Rand Corp., with whom he was associated before joining Northrop.

The study was to help determine the type of military transport to be developed to meet future logistic requirements. It covers an extensive range of designs, types which are assumed to be operational in eight to 10 years if the necessary development were carried out from the present.

Design payloads vary from 25,000 to 170,000 lb, ranges are from 1,500 to 5,500 nautical miles. Field lengths were assumed from 2,000 to 6,000 ft and cruising speeds between 180 and 400 knots were considered. Compound maneuvering, takeoff and landing rates were used.

► **Design House**—Recently the company has announced that James and Clark, Inc., top architectural and engineering firm, is to prepare a master plan for the expansion of the Northrop facilities. Included are the firm's most advanced engineering and research centers.

In this engineer's domain house, the Northrop team will turn their vision into tangible hardware.



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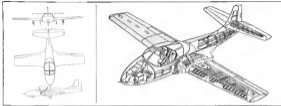
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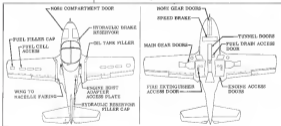
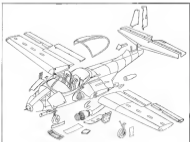
## Details of Cessna XT-37 Twin-Jet Trainer

New Cessna twin-jet intermediate trainer, the XT-37, is shown here in various aspects, revealing its general makeup. Incorporating side-by-side seats, it is the first Air Force trainer of its type. The XT-37 first flew Oct. 12 (Aviation Week Oct. 18, p. 17).

Plane is powered by two 600-hp Continental SP9-T35 engines. Flush ribs on each side of engine eliminate the need for struts or bridle when in taxing or landing the aircraft.

All access doors for servicing and maintenance are accessible from the ground. A large access door at bottom of each nacelle is available for engine inspection and required repairs. Landing tunnel doors give access to control system and hydraulic equipment for inspection and maintenance.

Access to battery, radio, avionics, solenoid regulators, and engine battery is easy through large doors on each side of the nose.



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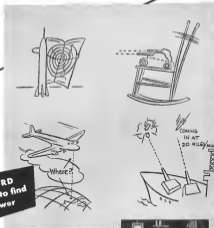
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DELTA WING is clipped to avoid problems with too much flexibility at the tips

## NACA Shows Lift-Fuselage Model

An unusual study configuration with possible application to a future supersonic subsonic was exhibited recently by the National Advisory Committee for Aeronautics at the opening of San Francisco's new airport.

NACA was careful to specify that the plane was not an actual aircraft design, but simply typical of many tested before. "The model was an eye-catcher, nothing more," said a spokesman for the research agency.

Yes and No—Everett and, not, the model is an intriguing hybrid. Basic feature is a lifting fuselage, a design idea that has received much attention lately. Aerodynamic calculations show that a flat-bottomed fuselage can supply large portions of total aircraft lift at Mach numbers and angle of attack extremes.

In extreme cases, designs completely without wings appear possible, and ex-

tremal surfaces would supply only stability and control.

Logician engineers do not differ much on current position, they have long, that wings leading into the neck, and boundary layer flows inside the opening. Such a configuration would appear to be equally adaptable to a supersonic or a subsonic turbine.

Wing and Tail—The basic delta geometry of the wing has been modified for structural reasons, not for aerodynamic. Original line, if extended to the theoretical tip, might have given a planform with too much flexibility at the tips.

Ventral fins are for stability and control at high angles of attack (provided by leading, for example) in this attitude, the downwash from the forward part of the fuselage reduces the effectiveness of the vertical tail. The re-

son the fins are angled outward slightly to reduce the length of leading edge exposed for adverse elements.

Through continued study and tests of typical models like the one shown here, NACA scientists keep in step with design thinking in industry.

## THRUST & DRAG

One of these days, a smart engineering school is going to start a curriculum leading to the degree of Investigating Engineer. Graduates of this course will be able to make a good career moving on commodities appraised to investigate the guided missile program.

The recent announcement of the formation of the Northrup Company's branch machine sweeping away of the missile work-unit. Like others before it, the creation—good and bad—has not had and their constant will labor hard and long and write a report.

It will take six months to write the report and another six months for its review. By then, its recommendations will be hopelessly out of date—or at least, the will be the class of the contractors whose attitudes were developed and there will have to be another committee. This one goes on until we run out of time, and then we won't really need any more investigations.

Most frustrating military job nowadays must belong to the officers charged with placing Nike batteries around the countryside. Since time back, congressmen were leaning on these officers to hurry and do something about de-arming, de-arming, de-arming, de-arming with the new wonder weapons.

So the military, ever responsive to the demands of the citizenry, heated gets trying to get batteries used here and there. Now what?

The same congressmen are back, leaning on the new officers, to hurry and do something about getting the new wonder weapons out of deep Gethse and East Germany where they are training enemy soldiers and the money and the good weapons and the armory's dangers.

Lockheed's proposals, models, plans and associated material for the current USAF nuclear competition weighed in at 1,187 pounds in terms of weight as shown (apparently) to the Air Force. I can remember when a proposal consisted of a 10-page report and a single study model.

"Watch from the back of the room." I can remember when a whole airplane weighed less than 1,187 lb." —DANA



Most "D" Sabre jets are in use today but all other types of USAF interceptors combined.

## Why the F-86D Sabre Jet Interceptor Now Climbs UPSTAIRS....20% FASTER!

New production model J47-GE-33 jet engine packs more thrust,  
also improves "D" reliability and ease-of-maintenance



NEW J47-GE33 VARIOS allow them all to enter component of J47-GE33 engine. New varios have same configuration as those used on J47-GE-17, but any oil is introduced before firing dry and subsequent operations.



IMPROVED RELIABILITY in the J47-GE-33 engine is illustrated by the new "floating" main shaft valve design. It reduces the possibility of about dry run on turbine wheel bursts. 0.8 inch gap is provided in new adjustable turbine buffer.



NEW, LARGER "EYE-BO" handles increased J47-GE-33 engine. New "Eye-Bo" has a sturdy cross-section bore hole as a rotation shield, allows higher clearance fuel flow and prevents secondary loop cooling of the turbine.



CARBIDE J47-GE-33 QUALITY CONTROL is 0.4 manufacturing plants is already paying dividends to the Air Force. For example, only one out of four J47-GE-33's new engine has been found to be in need of the USAF.

For the past three years, North American Aviation's F-86D Sabre Jet has been the fastest interceptor in the Air Force's Air Defense Command (top speed over 530 mph).

Today a new General Electric turbojet, the J47-GE-33, is being installed in "D" Sabres. The engine makes the "D" still faster ... more reliable ... easier to maintain.

The J47-GE-33 has the same basic design as its predecessor, the J47-GE-17. But there are improvements: reduced weight, increased durability, and, most important, allow it to swallow more air and increase its efficiency point.

1. New inlet guide vanes

2. New capacitor discharge engine ignition system
3. New "floating" turbine wheel drive shaft
4. New Hotstart afterburner system
5. New turbine wear-line for afterburner
6. New larger variable area jet nozzle

The J47-GE-33 can gain 30% of the time usually required to "accelerate" an F-86D from standing start to 45,000 feet.

By helping the Air Force reduce maintenance time and costs, as well as increase jet performance, the J47-GE-33 again illustrates the G-E slogan, "Progress is our most important product." Section 232-1, General Electric Co., Schenectady 5, N. Y.

*Progress Is Our Most Important Product*

**GENERAL  ELECTRIC**

►Harvey Aluminum, Torrance, Calif., announced a major expansion of forging facilities, including an 8,000-ton forging press and two 4,000-ton casters. Completion date of the housing structure is targeted for early next year. The buildings also will accommodate secondary forging operations such as trimming, heat treating, etc. Production on the new press, scheduled for middle of next year. The 8,000-ton unit will have an available forging area of 40 sq ft.

►North American Aviation, Inc., is putting up a new 750,000-sq-ft manufacturing facility at its main plant, Los Angeles International Airport. Structure will cost about \$12 million and will handle F-100 Super Sabre production as well as work on newer planes. It is expected to be in operation next February.

►Spangco Engineering Corp. is new owner of Spangco Engineering & Sales Corp., Gardena, Calif., maker of aircraft and industrial test equipment.

►Aero Supply Manufacturing Co., Inc., Cary, Pa., has entered into an agreement with W. W. Rich, Northridge, Calif., to make and sell as a national item, a novel airlock-operated shut-off valve said to be about one-half the size and weight of most conventional units. More than 180 variations of the valve have been developed, ranging up to

1-in. tube size, capable of handling all standard fluids at pressures up to 3,000 psi, at once.

►Kraus-Witzen Laboratories, Inc. has been formed to handle specialized fatigue tests of materials and repeated loading of parts and components. Firm, located at 6845 Hawthorne Ave., Van Nuys, Calif., is headed by Gloria Kraus, well known for her original design and building of equipment in this field.

►Engage Works, Inc., has moved into new facilities for business aircraft overhaul just off Lambert Field, St. Louis. New shop has over 1,000 sq ft of floor space and is being fitted with much new and specialized equipment.

►A. C. Smith Corp. has formed a Pacific Coast Works in Los Angeles to be a new manufacturing and service section devoted exclusively to aviation products. General manager is T. A. Henry. A. C. Smith handles some aircraft components production at its Milwaukee metal plant and several East Coast factories and its Rochester, N. Y., factory is devoted entirely to aircraft work.

►A new welding process, said to be 15%-20% faster and 25%-30% more economical than other manual and semi-automatic methods, has been developed by Westinghouse Electric Corp. Arc Welding Dept., Buffalo, N. Y. Now in production, the new technique involves use of a new coated wire—Westinghouse NS 20.



Diabolo Dassault

New double-shouldered landing gear—called "diabolo" gear by the French—is featured on the modified, Aerosol Dassault Dassault, scheduled for flight with the French Air Force. Adapted at the design was to meet NATO command interest in technical support systems which can take off and land on short, grass strips. Dassault now plans on this unit at about 1,800 lb., land in less than 1,000 ft. Phase is equipped with a full engine package for short landings. Tests have been made at the modified Dassault at the Bagley Field test center. The man-



ufacturer is the 330 Dassault in service with the French Air Force could be adapted for the diabol gear.



WILSON developed at Glenn L. Martin Co. enables one man to handle normally multi-person aircraft components of which two to three men to hold during previous method of operation. Small parts are being done in overhead room, large parts are mounted in three CG in an new built out from the base of the machine.

►Northrop Aircraft, Inc., Hawthorne, Calif., reports that \$2,151,500 has been used as a result of about 14,000 inspections conducted by inspection unit 946, with approximately 3,500,000 used by 673 inspectors during the fiscal year ended July 31. Aircraft for inspections ranged from \$5,000 to \$10, with five of the former having been granted.

►Tough new blades made of Kevlar metal (Kevlarite, Inc., Pittsburgh) have cut more than 120 min. of aluminum alloy without appreciable wear in the blades at Fletcher Aviation Corp.'s Pasadena, Calif., plant. The eight-inch area, powered by two 1 hp. motors, runs at 3,000 rpm with a 25 ft. feed making possible only in dry tests. The area was developed by Dr. John Fletcher. Previously, four men using hand operated metal could make only 150 cuts daily. Kevlarite is a powder molding product using isopropyl and isobutene, carbon and carbon for toughness.

►Aradco Corp. has been formed in Fort Worth, Tex., to exploit advantages of a multi-stage electrode position pattern used in atmospheric metal pattern for longer wear. Firm has acquired a 12,000-sq-ft plant.

►Stratton, Inc., maker of detachable base fittings and flexible hose assemblies, has opened a 10,000-sq-ft plant at 9420 Wilshire Ave., Los Angeles, to serve West Coast, Alaska and Hawaii.

►Aerocut Division of Lofco Products Co. of New York, Inc., has completed a new 153,000-sq-ft Kibitz boundary and installed three new Comstock, giving the firm a total of 28 deep bays.

## AVIONICS

# Diode-Amplifier Is New Threat to Tubes

A new type amplifier which uses two-element semi-conductors (diodes) holds promise of shortening many of the vacuum tubes now used in airborne and ground-based digital computers, cutting their size and weight. It was developed at the National Bureau of Standards.

Oddly, the new diode amplifier owes its operation to a characteristic of semi-conductors which has heretofore been considered undesirable—the reverse transient phenomenon. The new technique can be applied to diode count, pulse register stages, vacuum types of flip-flop circuits or used as a wide-band, full-response amplifier. Power gain up to 10 per stage have been obtained.

The new diode amplifier was developed by A. W. Rich, chief of NBS's components and digital techniques section, data processing systems division.

►High-Frequency Operation—To utilize the new silicon diodes, a common-diode type flip-flop has been operated at 100 Mc. Frequency as high as 25 Mc. With anticipated future improvements in diode response time the new amplifier may be able to operate at microwave frequencies, NBS says.

One basic requirement for the new diode amplifier is that it must be supplied with power loss in RF source whose frequency equals or exceeds that of the modulating signal. In this respect, the diode amplifier resembles magnetic and electronic amplifiers.

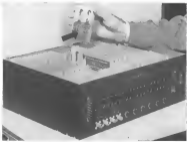
►Principle of Operation—To understand the diode amplifier, it is necessary to recognize the two static states in which a germanium or silicon diode can be placed.

►Forward conducting, characterized by high conductivity, is caused by applying a forward voltage in that the diode's mode becomes more positive than its cathode.

►Reverse conducting, characterized by low conductivity, is achieved by applying voltage of a reverse polarity.

The forward voltage acts to cause a steady supply of "current carriers" within the area conductor material, thus maintaining a condition of high conductivity. During reverse polarity timing, current carriers are not created.

►Transient Phenomenon—If a voltage applied to a diode is switched quickly from forward to reverse voltage, a transient phenomenon occurs in which a large reverse current flows for a brief interval deriving from the stored



THAT DIODES MAY BE AMPLIFIERS in today's avionics equipment, permitting size and weight reductions. Compare size of diodes (circles at arrow) with amplifier tubes above them.

charge static is stored. This transient current, known as the current of the forward voltage, remains available to be swept out in the reverse direction when the opposite polarity voltage is applied.

If there is a delay between the application of the forward and the reverse voltage, the number of current carriers remains, with the length of the interval.

►Similar to a Transistor—During the transient period of operation under reverse voltage, the diode's action may be likened to the operation of a transistor, NBS points out. In a transistor, the carrier can be viewed as a diode during the forward conducting state and its collector as a diode in the reverse state. If any of the carrier

carried by this forward biased "diode" (anode) are injected into the vicinity of the reverse-biased "diode" (cathode), a current larger than saturation current will flow in the cathode.

When a voltage is applied to the transistor circuit, it produces current which causes current. There is no change the static current in the collector. In the case of a junction transistor connected in a common-emitter circuit, the collector current is almost equal to the anode current, so that reverse gain is effectively decreased by the ratio of the transistor's forward and back saturation values. Power gain is achieved by its effect in reducing current and from a low impedance output to another one of much higher impedance.

►Alternate Cycle Operation—The diode amplifier achieves its power gain in a similar manner, except that the diode functions both as the emitter and the collector, but at different times. During one half cycle, the anode is more positive than the cathode and acts like an emitter, injecting current into the area-conductor at a low impedance level. During the other half cycle, the anode becomes like a collector, withdrawing these same carriers at a much higher impedance level.

One of the simplest forms of diode amplifiers is the common-base diode circuit shown on p. 56, Fig. 1. A 100-



COMPARISON with point of increased power streamers outlines of vacuum tubes.



# Valve Talk

for WM R. WHITTAKER CO., Ltd.

By Hervey Miles,  
Senior Member, Aviation Writers Assn.



Whittaker's growth over the years naturally has been paced faster than its pace by progressive changes in all the company's various divisions—which the most recent change brings a new order in Field Engineering, the establishment of a chain of command.

Vice-President Glen Whittaker heretofore had directed the company's aviation-wide Field Engineering operations almost single-handedly, keeping personnel up on virtually every account, every valve, every problem and assuming overall responsibility.

His previous and considerable role in this building began before the war and after, however, both in the executive capacity of a department head in the home plant and in the various field offices to the point where Whittaker, in the Field Engineering division, was called on for acceptance of the industry as an on-the-ball chief.

Of the various engineers who played important roles in building field service and profitability, it's like to mention them here, although every one in the department deserves one. They are Bill Olson, Art Geringer, Dick Ockinger who joined Whittaker in 1945, and others, 1945-1948 to 1951 respectively.

Bill, a World War II B-29 pilot, was in charge of Whittaker's Western Field Engineering office until 1951 when Geringer took over. Bill's office handles North American Aviation's home plant, Douglas, Boeing and Lear, Inc.

Art, who is former Air Force pilot and known widely for his grin and his nickname, "The Senator," directed Whittaker's San Francisco field office with Allison, General Electric, Continental, the Wright Air Development Center and North American's Coleman as his principal accounts.

Dick, an avowed military officer during the recent suppression, handled the company's New York office with primary responsibility for Republic, Cessna, Pratt & Whitney, General Electric, Lycoming, Ford and Buell.

Such was the status quo until August when two events occurred: (1) Whittaker resigned, leaving Engineering, leaving a new and heavy burden of administrative responsibility on the shoulders of Glen Whittaker (2) Bill Olson, a close colleague to Glen, resigned to become director of sales for Cessna Air Products, Inc. Los Angeles specialists of hydraulic and pneumatic aircraft equipment. Bill was requested

and welcomed both by Whittaker and at the recent industry he left with the least amount of fuss from Bob Whittaker on down.

Focus was the fact that he could no longer keep his finger in every Field Engineering pot. Glen implemented a program he had been considering for some time. He checked the position of Director of Field Engineering and appointed Art Coleman to the Los Angeles job, just when North American's home office is in full swing, and appointed Dick Ockinger Eastern Division Director to oversee the New York, Baltimore and Indianapolis offices.

By the first of the year these changes should be in full swing to materially strengthen the entire Field Engineering force. Glen will spend the experience of two years over immediate field and they have the unqualified support of all engineers in the department. In time other new assignments will be made as changes designed to assure even more comprehensive coverage.

So how about Art and Dick? What kind of men are they?

"Senator" Ockinger described him as "serious and reflective, but a good and low key, with a good sense of humor and a good grip" a man who knows well the value of persistence, self-discipline and cooperation.

Ockinger is a big man, with his bearing length to match. Like Art he has a dick knock for approving both sides of a problem. And it is said he is so thorough that if you ask him when time it is he'll tell you how to build a clock!

Then two Michigan-olds will be sent to Art Whittaker and Whittaker—and for their assistance as well as their friendship. They are expected to be in the field after the company and Glen's return in 2 days, will be expected up to 2000, Manchester in Area, 55-15 Northern Blvd., Woodside 77, N.Y.

To be right, it's got to be right both ways!

Fig. 3, through another diode from a clock voltage which is 180 degrees out of phase with the main clock supply at A. When A is a positive, point E is at a positive potential, and conventional (forward) current flows through path A-C-D-E. In the next half cycle, the power close path goes to zero, point E becomes positive, disconnecting the diode between points D and E. During this same time, point E is charging the diode capacitor for the next power clock pulse, and the series diode and resistor between points C and D is providing a discharge current for the capacitor.

NBS is believed to be investigating means for obtaining intrinsic current gain from a diode amplifier which would enable it greatly to simplify circuit design and assembly.

Computer Controls—Bell has developed pulse-amplitude-modulated current supply diode amplifiers, which can be used to activate computer pulses. It can, with assistance of a transformer diode coupled amplifier and an inhibiting gate. Extra logical "and" (inhibiting) gates may be added. NBS says.

Hot also has developed a variety of dynamic flip-flop circuit which can remain stable either in an oscillating or a non-oscillating state. One is a current-diode type whose applied frequency can be varied in a wide range when germanium diodes are used.

Silicon Diodes Foster-Silicon junction diodes, with their much faster transient recovery time, can be operated at much higher frequencies. One experimental NBS current diode type of flip-flop using a silicon junction diode and operated at a 25 mc. clock frequency, exhibited switching times of about 50 picoseconds, as NBS spokesman told Aviation Week.

With swift, stages of silicon diodes even higher-frequency operation should be possible, NBS claims.

—Philip Klum



## Remote Indicator

Miniature remote position indicator system, using 28-v d.c. excitation, weighs only 0.4 lb. The 14-in. indicator reportedly is accurate to within  $\pm 5$  deg, can be operated between  $-55^{\circ}\text{F}$  and  $+160^{\circ}\text{F}$ , up to 10,000 lb. shaft torque. It is available in 1-in. diameter, 2-in. diameter, 3-in. diameter, 4-in. diameter, 5-in. diameter, 6-in. diameter, 8-in. diameter, 10-in. diameter, 12-in. diameter, 14-in. diameter, 16-in. diameter, 18-in. diameter, 20-in. diameter, 22-in. diameter, 24-in. diameter, 26-in. diameter, 28-in. diameter, 30-in. diameter, 32-in. diameter, 34-in. diameter, 36-in. diameter, 38-in. diameter, 40-in. diameter, 42-in. diameter, 44-in. diameter, 46-in. diameter, 48-in. diameter, 50-in. diameter, 52-in. diameter, 54-in. diameter, 56-in. diameter, 58-in. diameter, 60-in. diameter, 62-in. diameter, 64-in. diameter, 66-in. diameter, 68-in. diameter, 70-in. diameter, 72-in. diameter, 74-in. diameter, 76-in. diameter, 78-in. diameter, 80-in. diameter, 82-in. diameter, 84-in. diameter, 86-in. diameter, 88-in. diameter, 90-in. diameter, 92-in. diameter, 94-in. diameter, 96-in. diameter, 98-in. diameter, 100-in. diameter, 102-in. diameter, 104-in. diameter, 106-in. diameter, 108-in. diameter, 110-in. 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## Avionics Companies Report Changes

Formation of the Mahan Instrumentation Co., specializing in instrumentation, research and development, primarily for the aircraft industry, is one of several recently announced additions and expansions in the avionics field. The new company's address is 541 Tia quote St., San Diego 5, Calif.

Other avionics industry expansions include:

- Elgin National Watch Co., has purchased Neumatic, Inc., Los Angeles, which develops and produces instru-

ment avionics components. The move was Elgin's first since it earlier announced plans to diversify its product line.

The new Elgin subsidiary, which employs around 100 people, makes a substantial entry seeking only 0.015 on T. R. Wick, who founded Neumatic, will continue as director of research and development.

- International Resistance Co., maker of resistors, has purchased Van Dyke Instruments, Inc., manufacturers of precision potentiometers. The new IIRC subsidiary will be operated by its present management.
- Magnetic Research Corp., El Se-

pusdale, Calif., producer of magnetic amplifiers, has moved to new plant at 100 Center St., giving it four times its previous floor space.

- Kanton Industries, Inc., has moved to a new plant at 100 Cliff St., Haverden, Conn. Kanton's products include small electronic units for remote equipment.
- General Division of General Dynamics Corp. has been directed to the Radio Technical Commission for Aeronautics.

## 1971 FILTER CENTER 02233

► New Computer Technique Shuts Military-Weight Air Development Center engineers reportedly are confident over the possibility of extremely simple and digital computer opened up by fundamentally new technique developed by Floyd Steele of Lockheed Industries. First limited public disclosure, at Western of the new technique which cut number of tubes by a factor of 10 to 20, was reported in *Aerospace Week* Sept. 17, p. 72.

► Wanted: Teleconferencing Paper—National Teleconferencing Conference, scheduled for May 31-33 in Chicago, is looking for technical papers on the subject, particularly on:

- Instrumentation for flight testing as craft
- Remote control of missiles and pilotless aircraft
- Remote control aspects of the automatic battery
- New components for telemetry

Contact: E. L. Greenberg, W. L. Moore Corp., 460 W. 14th St., New York 13, N. Y.

► Wanted: Good Static Air—Major problems confronting aircraft designers in high-speed jets is obtaining a good static air pressure source for use in common altitudes, speed, and Mach number control under all airplane flight attitudes and configurations. Problems, cited by Mel Johnson of General Electric speaking to the New York chapter of Professional Group on Aeronautical and Navigational Electronics, is particularly critical in transonic region. Johnson said pointed out that independent term consideration is needed when a pilot does the loop between an outer engine and its fire control system.

► Airborne Radio for Business Plans—First installation of airborne radio warning system in a business aircraft has been made in a Cessna 441 by Elmer Electric Co., DC-8 by Remington-Walker, Inc., St. Louis. The set is a Bendix Radio RDR-1 (N boat). —PK

## EQUIPMENT



BENDIX RADIO'S MPN-5 TRAIN control system of tractor, radio trailer and power trailer. Professional and U. S. Navy have bought MPN-5.

## Bendix GCA Set Stresses Versatility

By George L. Christian

Baltimore—An order for fleet mobile AN/MPN-5 GCA radar sets has recently been awarded Bendix Radio by the Navy government. The versatile equipment costs \$1.5 million a set, or more than a million dollars when spare set (shown in).

For this price, the buyer gets a ground receiver and that can land security of all types and rates in continuous radar at a rate higher than can be approached by any other GCA equipment in the world, says Bendix.

The only limitation to the landing rate is imposed by the accuracy for clearing aircraft from the runway after landing, according to Bendix.

The company has about half-completed another order, the one for 24 MPN-5 sets for the U. S. Navy, Bureau of Ships.

► Mobile Radio Navigation—Bendix Radio stresses three features of its MPN-5 (MPN stands for mobile pulse navigation) sets:

- Maximum flexibility. The entire set, made up of a powerful tractor and three rugged accessories, is completely mobile and may be driven from one runway to another without ceasing operation. The equipment may also be driven from one airport to another, if the road will support the rather large and heavy tractor and form.
- High versatility. Housed in the MPN-5 are five radar channels and 12 con-

stantaneous alt, giving a total of 171 instantly selectable channels.

Bendix indicates the set incorporates "seven features found to be desirable in any pulse GCA and has many other special developments which have been included for the first time in a mobile radar set."

The MPN-5 has its own self-contained diesel engine power supply. It is air conditioned (both heated and cooled) and carries its own spare parts. Bendix Radio officials say the design of the entire system was predicated on maximum reliability, simplicity, ease of operation and maintenance, and a high degree of accuracy.

► Mobile & Waterproof—One of MPN-5's main features, attributed to its extreme mobility, coupled with maximum

accuracy, all-weather radar coverage from a waterproof feature which allows the whole train to be submerged to a depth of 50 ft without damage. In addition, the entire set has also been completely waterproofed. The track tractor can run in 5 ft of water, but the tow bar has to be removed and operation is restricted to 15 minutes. The reason the tow bar could be driven off an LST in water depths not exceed the 5 ft limit.

The tractor only is equipped with radio facilities to allow the driver to keep in touch with the control tower. All radio and radar equipment can remain in operation while the MPN-5 is moving.

Since lateral alignment adjustments are prohibited, the MPN-5 need approach in parking area at only 90 degrees, the correct angle after which the equipment can be loaded up precisely. Electric pads are provided to level and lower the tractor.

To insure maximum mobility, the MPN-5 can be driven over any kind of road or across rough ground of fields. It can be loaded on to the dock or into the hold of a ship (for which special slings have been provided). Or it can be transported by railroad. The equipment may be lifted up to 45 deg. without damage.

Bendix claims "The MPN-5 can serve as a 30-mile surveillance radar system, a precision approach radar and a complete airport control tower area



AS-RL INDICATOR display shows altitude and direction on final approach.



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Style I, type of  
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Style III, type of

### MIL-C-4479 (USAF)

Type I—Class I  
Type II—Class I

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**16.39¢ per revenue ton mile!**

Day-in, day-out operation under every condition is proving the Curtiss-Wright Turbo Compound engine to be a real money-maker for the airlines. Its greater profit power, like its greater horsepower, stems from harnessing exhaust gases to give a 20% more output or 20% more range than any other engine of its type.

In the world's fastest long-range transports, the Douglas DC-7 and the Lockheed Super Constellation, the Turbo Compound reduces direct operating costs, exclusive of depreciation, to 14.3¢ per revenue ton mile\*—lowest of any modern transport.

And these operating costs will go still lower! Current maintenance costs for this still relatively new engine type amount for 3.1¢ per revenue ton mile. As experience and time are built up in engine maintenance practices, this figure will fall, providing still greater savings to airline operators.

\*Based on current U.S. airline demands operations for the first 6 months of 1948. Depreciation has been included because of wide variations in airline depreciation rate policies.

**Turbo = greater Tonnage  
Compounds at lower Cost**

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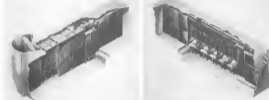
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*World's Finest Aircraft Engines*

Curtiss-Wright set made no approximation to these great airlines, whose selection of the Turbo Compound has opened a new era of economical, high-speed transportation around the world.

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SOUTHWEST OCEAN AIRLINES  
PACIFIC INTERNATIONAL AIRLINES  
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**RAдар TRAILER**—Rear side (left) shows part of PAR vertical antenna, control panel, etc.; side view (right) shows scope and indicators.

it includes wind direction and level measurements plus an altimeter setting instrument in standard equipment. Spare parts are carried to assure an extended period of self-sufficient operation. The sturdy diesel also can be used to supply 25 kw., 400v., 3 phase ac current for other airport equipment or for runway lights, if desired.

► **New Developments**—C. W. Hulse, director of experimental work at Bendix Radio Sales, and former system engineer on the MPN 5, told *Airways* West that the company possessed a number of new developments for the MPN 5.

Bendix designed all components of the MPN 5 to be completely compatible with each other rather than group independent components. This is the only way to assure a completely self-sufficient system, Hulse says.

To assure the greatest simplicity possible in the radio trailer's wiring (there is over 25,000 ft. of wiring in that one trailer alone), no splices were allowed. Each wire can be traced and replaced without disturbing adjacent wiring because each individual wire starts and ends at a terminal.

To keep the trailer from wobbling and bobbing as the scanning antenna oscillates through the air, two fluid-mounted shock absorbers are used.

Antennas are made of plastic with aluminum wire accurately embedded in its surface. This does the work of the PAR (precision approach radar) set itself. They are made of a 90% elastic rubber by product and are de-

lustrable, so they may be stored in a small space when the MPN 5 set is not in use, or in on the road.

The radars hold their shape because of the cut of the material and the addition of a 3-in. air space between the radars' two layers. It is necessary to keep them in space constant to within about 1/16 in. because a greater variation would cause distortion of the radar's transmitted and received signals. To accomplish this, a series of small threads are attached to the inner and outer layers of the radars to keep the separating distance between them constant within the desired tolerance.

► **What's in It?**—Here are the facilities MPN 5 provides:

Five simultaneous radar operating positions. Two are PPI (plan position indicator) two A-EL (azimuth elevation) plus one conventional position. The conventional position is equipped with all plugs and cables to operate either a PPI or A-EL indicator as desired.

Changes can be accomplished in five minutes.

Provisions have also been made to operate pairs of PPI's and A-EL's together in line in 100 feet. This allows the radar equipment to be set up in the ready room in the spare parts trailer.

Each of the operating positions may be equipped with controls of up to a total of four complete communications systems—one EF (low frequency), one EH (high frequency), one VHF (very high frequency), and one UHF (ultra-high frequency) set or any combination of these units.

Two very readable microammeters, which are provided between all five positions, are entirely observable and the control tower. Included in the radio array of the MPN 5 are five ARC 17, five ARC 1, two ARI-13 and two ARR 15 communication sets.

Extensive use of signal lights at each position shows which communications channels are in use at all other positions, which radio controls are over-



**POWER TRAILER** contains direct generator and sets of communication antennas.

# 15 Horsepower in a 7'x11' case!



A typical example of American Electric engineering

This 480 cycle 3 phase motor for driving a hydraulic pump is a special special design, custom-developed by American Electric Motors Inc. Rated at 15 hp, continuous duty at 1,800 r.p.m., it actually produces 15 h.p. at any intermittent duty, yet weighs less than 1/2 cubic foot. A special case made of magnesium bolts weight down to a mere 32 lbs. or approximately 1/2 h.p. per pound. The motor is fully protected, corrosion resistant, meets ASD-20000 type XIII mounting specifications and is sealed against hydraulic oil. It operates within a temperature range of -67° to +252° F. Overall length of the motor unit is 7" with a 4" coupling extension.

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Division of American Electric, Inc.

plant, and whether or not the motor is close. (The last induction comes direct from the control tower.)

All motor controls are simple and color-coded and are lighted for quick and easy identification. Push-to-test roughing are incorporated where necessary to prevent controls being operated inadvertently.

• **Completely Dual-Complete**—guides by units have been provided for all cable and associated power equipment. Personnel have also been made to keep standby cable equipment "on hand" so that it can be brought into maintenance use through conveniently located control switches to ease the operating demand load.

In the MPN-5's power supply system, three dual engines drive the necessary electrical generating equipment. Any one diesel can supply sufficient current to operate a single AFR (single air-refueler control channel) and a FAR. Any two diesels can provide full dual channel (operating and standby channel) operation.

The full complement of three diesels provides full dual channel operation plus air conditioning. The latter is provided for operator's comfort and is not essential to order operation.

• **Easy to Maintain**—One of the major aims of the new design features of the MPN-5. Among the many devices used by Bendix to achieve this goal are:

• All chains are mounted on full-bearing drive shafts to simplify inspection and repair without interfering with operation or the functioning of other units.

• Red light automatically comes on if a roller seat is kept operative in the maintenance position. This serves the dual purpose of providing identification and a warning that dangerous voltages are present.

• Tablets may be changed through access doors without moving the chains as being exposed to high voltages. All doors close after various points, including the rear of all connecting cable plugs, to be exposed.

• All plugs, wires, terminal boards and terminals are easily identified through a system of color numbers which are contained in a wiring book.

• Adequate working space has been provided so that any faulty wires may be replaced quickly. Bendix estimates that "the most serious wire failure should be readily found in five minutes."

• Approach Radar—When designing and building the system approach radar components of the MPN-5. Bendix engineers stress for the greatest possible accuracy. They came up with a completely new guidance system, similar features of which are:

• Antennas. Horn fed, shaped as

## Federal transformer-rectifiers provide power for the MIGHTIEST little bomber in the world!

THE DOUGLAS A4G SKYHAWK is America's newest flying bomber to explode... a bomber bomber with an advance punch.

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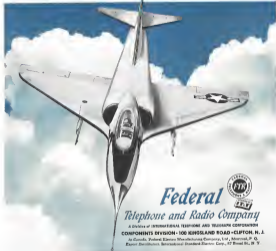
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targets are used to cover the entire glide path at all times. This wide coverage picks up considerable ground clutter, and the MTI methodology is cancelled out by inclusion of an advanced form of X-band MTI (moving target indication—a means of having the radar distinguish between stationary and moving objects).

•MTI. Presentation of the MPN-5 is straightforward, simple and clear, says Rodas. Targets are sharp, have good tails and "lockpoint" can be adjusted at demand to show up obstacles without cluttering up the image.

•Angle data system. The MPN-5 uses a simple footprint and completely adjustable 4° source system incorporating precision goniometers which allow exact linear reproduction of the antenna angle on the outside of tube throughout the entire scan.

Single and acoustic non-electronic adjustments are provided for approach path, glide slope, zero-off marks, etc., say Rodas engineers, and the built-in mechanical adjustments have the accuracy of a good micrometer. Reading the scan scale on both azimuth and elevation antenna is accurate to 0.01 deg. throughout the entire scan. Parameters are rugged and durable and change from one to another can be made in a matter of seconds without degradation of the display. Frequency changes do not affect the angle data system alignment.

•Toler. Since the display on the CRT is only as good as the value which translates the data into a color presentation, Rodas designed a completely new set of scales for the MPN-5. Comparison engineers on this through the use of these new scales "a degree of accuracy never before attained in any color set has been achieved in the MPN-5. Sweep circuit alignment is possible in this and that all tests, as centers are completely eliminated."

•Presentation. Rodas says that the instrumentation and information presentation at both azimuth and elevation data by MPN-5 today is a complete departure from the original ANEL display where only one scan at a time was presented.

The Rodas MPN-5 gives a smooth, uninterrupted display over a ten mile range. A new linear sweep is used so that three miles takes up about half of the display.

•Surveillance. The MPN-5's surveillance system provides 500 kw. transmitter peak output, a receiver MTI combination with gain of better than 35 db. and an antenna gain of 34 db.

Design of the antenna makes horizontal or vertical polarization possible. All operating modes and scans are controlled within the trailer to protect them from the elements and make them accessible for servicing.

•MTI. The surveillance MTI is a very efficient system, Rodas says. The equipment is extremely stable because of the highly precise alignment of all calibrations used with various.

•Display. The 12-in. CRT displays ranges of 5, 10, 20, 30, and 50 nautical miles. Off-centering is provided for in an direction up to two miles. This includes a specially designed scale featuring simplicity and reliability.

•Rotating point. The center's rotating point can handle only 1,000 low peak power. To meet this, the design and switch has been made part of the rotating point.

•Range. Rodas quotes the recommended range of the XN-1 Model of the MPN-5 as being 40 nautical miles on a better type aircraft at 10,000 ft. The 50-in. scan requirements are 35 miles. This range is obtained on MTI as well as on "normal" operation.

•Backlog. W. B. Clouse, Rodas Airways General Sales Manager, told Aviation Week that his division has a car-

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## ARDC Tests Thrust Reverser on J65 Jet

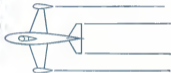
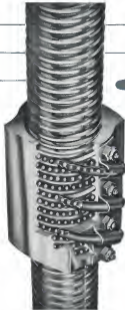
Experimental thrust reverse, designed and built at the Research and Development Center of the Wright Air Development Center, engine tests of engine surrounding two models. "Supers."

Proven test methods of vertical thrust action, which keeps test from some portion to defect test exhaust stream through scope of engine or F-105 jet.

WADC's Power Plant Lab's Engine In addition, Branch is working on scheme to correct Supers handle noise in cascade, and to reduce cascade itself between knowledge and tolerance with some thrust is not required. With ultimate investigation, these tests is expected to be about 175. Developers hope to keep added weight under 120 lb.

# Saginaw offers multiple circuits...

and multiple circuits in ball bearing screws offer multiple advantages



- **less weight** In a Saginaw Ball Bearing Screw every ball carries its share of the load. No balls "go along for the ride", simply as spacers. Thus, far fewer balls are required and therefore a substantially shorter, smaller and lighter nut is necessary to contain the balls for a given load.
- **greater capacity** Generally, a nut of a given length is capable of carrying a substantially greater load than those of other designs. Thus, either way, a Saginaw Screw is advantageous.
- **increased efficiency** Because with multiple circuits, no more than 20% turn for each circuit are required, the balls operate with greater fluidity—and maximum efficiency.
- **insured safety** In the rare event of a ball failure, in a multiple-circuit Saginaw Screw, only one circuit is incriminated, and the other circuits "carry on".
- **experience for you** The Saginaw Steering Gear Division participated in the development of the recirculating ball-bear screw. The continuous research and development of the engineering staff is available to help you increase the dependability and efficiency of the actuators in your product, and to cooperate with you on any new applications you may have.

Saginaw Screws can be supplied in 1, 2, or 3 circuits and in a complete range of load and life requirements for use with electrical, hydraulic or pneumatic units. Write today for our free engineering data book.

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acut loading of over 540 million in aviation sales. Total commercial backlog is \$5 million.

He also notes a substantial increase in sales of equipment to corporate and credit unions. He says that 1954 sales jumped 100% over 1953, and predicts that in 1955 this increase will be 100% over 1954.

## Boeing Gives Details On 707 Gear Failure

Detroit—A detailed analysis of why Boeing's first jet 707 tanker/transport's brakes failed on landing Aug. 5 (Aviation Week, Aug. 16, p. 37) was given here by Ed Platana, Boeing assistant project engineer-synchro, at the Vickers 1954 Transport Aircraft 15th Annual Conference.

The analysis was contained in a paper which Platana delivered, entitled "Design of the Hydraulic System for the Boeing 707 Transport."

Here are the facts as Platana explained them:

► **Bad Brakes**—Boeing's chief test pilot, A. M. (Tex) Johnston, had all the hydraulic lines that operate the landing gear when the 707's wheel set up in a ditch with "a badly braked wheel."

► **He was making his first night landing** at a twilight landing in the 707.

► **He was making his first landing** with the 707's landing weight over 108,000 lb.—it grossed about 134,000 lb.

► **He was checking elevator effectiveness** and so held the 707's nose off the ground until the last second. This meant that the brakes were not applied until the nose gear was lowered to the runway—and less than 2,000 ft. of run was available.

Platana outlined this sequence of mechanical events, leading up to the brake failure, so fast, so hot, so bad.



## Key Holder

Key Kly holds key in hand at low stress, providing a semi-permanent handle to the screw for tightening. It is easily removed when desired. Manufacturers report it is especially useful for repetitive operations where key set screw must be tightened and released. It comes in 1/4, 5/16 and 3/8 sizes. Miller & Vian Engineering, Inc., 4512 Beverly Blvd., Los Angeles 4, Calif.

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# "fire zone" fatigue



Arcosil connector replaces metal on supercharger intake duct.



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New techniques developed by Arrowhead in fabricating complex ducts, sleeves and couplings from Arcosil flexible silicone rubber impregnated fiberglass have opened amazing new design possibilities. In addition to Arcosil's ability to withstand heat, vibration and torque-reaction fatigue, the materials permit the parts to be formed to almost any conceivable shape and size to meet individual specifications.

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Arrowhead specializes in solving difficult flex-connector problems in fact, oil and air systems. Arrowhead field engineers will gladly provide further information and assistance.

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of you responsible for hydraulic design will assist for some reason.

- **Conditioning Factors**—Four items actually contributing to the brake failure were:
  - Excessive use of brakes immediately prior to stall.
  - No brake line bleeding after removal of test equipment.
  - Excessive volume of oil in the brake pistons.
  - Insulation of force in the deboost valve.

Design of the lines requires 50 psi hydraulic pressure in the lower section of the deboost before the piston runs, allowing the low-pressure side to refill in case the brake capacity exceeds the deboost capacity. A similar line nearby runs in the R-47 but gives very satisfactory service, according to Pilbeam.

Before taking off on the flight which ended in brake failure, Johnston ran the 707 through several brake tests. Then with brakes still hot, he took off and climbed to high altitude. This caused the brakeless fuel trapped in the brake piston to boil, forcing vapor which drove fire all back through the line into the deboost where the pressure was relieved by a built check valve. When landing gear was extended at high altitude, hydraulic lines to the brakes and the brakes themselves cooled rapidly. This a partial vacuum formed, pulling the deboost piston to the bottom of its chamber. Since no pressure was exerted the piston was not actuated to allow lines to be refilled.

So, when Johnston landed the 707, all cockpit instruments were normal, yet it was physically impossible to get hydraulic pressure past the deboost. He felt one "badly brewed soup."

### WHAT'S NEW

#### Telling the Market

Dexter Machine Products, Inc., Chilton, Mich., has published an 8-page booklet entitled, "A Drive to Earth Story of Precision Instrument Gears Cuts," which outlines various factors going to make up gear cost and tells what Dexter's place is in the field. Labor information on better alternatives and services is given in 14-page booklet available from Kester Manufacturing & Chemical Sales, Inc., Industrial Service Division, 1924 Bondway, Oakland 12, Calif. Pawtucket high-performance aircraft bearings, engineered to meet requirements of National Aircraft Standards Committee's Spec NAS 547, is described in brochure available from Speedy Mfg. Co., Aircraft Fastener Div., Waterville, Conn. The Spec. required by NASG on Mar. 1, 1954, calls for a high-strength, quick-



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A fast, pilotless, jet drone missile, the Ryan Firebee has been made both more

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These mounts were selected to isolate the J-60 because they provide the required "softness" for good absorption of vibration and shock—together with self-aligning action, stability and strength. In fact, the same mounts are noted for exceptional isolation of engine vibration in many well known heavy-duty trucks and buses also.

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\*MB is a Pat. Reg.

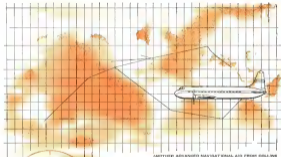
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Collins new Magnetic Compass System, the MC-101, is a standardized magnetic compass designed to furnish all airplane navigation instruments the required magnetic heading information.

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High sensitivity of the gyro sensing system to the instantly accurate flux detector provides the needed accuracy for modern day aircraft operation.

The pilot has complete control of the various modes of compass operation by the use of a simple three way toggle switch. He can select automatic or D-G functions, and can manually control the D-G left or right.

Outgoing of the Collins Compass greatly may low replacement without disturbance to instrument panel. The D-G and amplifier control is the radio rack.

No additional amplifiers are needed. A total of three transformers in addition to the D-G automatic pilot pickup provides more than adequate system output as well as electric isolation between various heading loads.

Magnetic amplifiers are used extensively for automatic heading. Magnetic interference in the compass amplifier provides instant flexibility and servicing convenience.

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release, rotary-type, stud and recognize features capable of receiving standard back with minimum deflection.

## New Publications

The ALPA Book is 46-page brochure, talking in words and pictures the background function and organization of the Air Line Pilots Assn. ALPA's address: 15th St. and Cicero Ave., Chicago 26. The 1954 edition of CAA's Statistical Handbook of Civil Aviation is available from Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. for 50 cents. This month's issue contains all available statistics on transportation activities to Jan. 1, 1954.

New illustrated, lavishly written booklet designed for engine distribution tells how machinery makes jobs, operations and better standard of living. Title is "The Advantages of Combustion," J. Lathrop, What the Machine Tool is Doing to Civilization. For sample copy and price, write to Foreigner Publications, 11 N. Wacker Drive, Chicago 6.

Authoritative 50-page book, entitled "Safety, Its Fundamentals and Goals," is official aviation change by Kester Seldner Co., 3101 Weymouth Ave., Chicago 39, Ill. Dept. IT. "Aviation Data Book, 1954 Edition," issued by Reynolds Metals Co. offers 120 pages of detailed technical information on aluminum. Available free of charge to engineers, designers etc. who request it as company lithograph, price is \$1.00. Reynolds Metals Co., Box 1500 South Third St., Louisville 1, Ky. New descriptive catalog for wrought aluminum and its alloys is given in handy wall chart available from Kaiser Aluminum & Sales, Inc., Industrial Service Div., 1924 Broadway, Oakland 12, Calif.

## Company News

Tand Corp. is the new name for four companies that recently consolidated. The companies: Tronair Aids, Inc.; T. S. Corp.; F. A. Inc., and Tronair Aids, Inc. Address is: 10000 Oak, Calif. Corporation, is offering illustrated 16-page catalog showing its 30 size and 35 new, lightweight and also recording current.

Lead Aviation, Inc., is newly formed international sales, service and supply organization, with executive office at 247 Park Ave., New York, and plant operations at Millville, N. J. President is Edward Lead, vice president is Howard L. Hirsch.

U. S. Industries Inc., is new name of Second Street Gas Co. Inc., Box 177, Buffalo, Conn.

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## FINANCIAL

### Plane Sales Bolster Delta Report

But capital gains will be smaller in the next fiscal year, although operating earnings should show a gain.

Delta Air Lines' recently released 1954 annual report, together with its first-quarter statement for the 1955 fiscal year, shows every indication that the airline has overcome the unpropitious economic involved in absorbing Chicago & Southern Airlines into its system.

(Delta is one of the two trunk carriers whose fiscal year ends June 30; the other is National Airlines, dissolved in Aviation Week Oct. 4, p. 42.)

► **Equipment Profit.**—The Delta C-68 merger became effective on May 1, 1955. For the fiscal year ended June 30, 1955, Delta reported net income of \$13,347,949 or \$2.18 per share on 6,110,000 shares outstanding.

As with National's results, however, the bulk of Delta's profit this past year came from the sale of flight equipment to specific buyers, \$1,072,165 of Delta's total reported net profit was realized through the disposition of aircraft. Net capital gains for the 1955 fiscal year

were higher, aggregating \$1,756,551. Net income from operations (after taxes) amounted to only \$235,584 for the 1954 fiscal year. This operating income is after an adjustment of \$455,513 to allocate the property acquisition account nothing from the merger.

Any comparison with 1953 results is misleading due to the separate operations of the two constituent companies now forming the merged enterprise. It is most interesting to observe, however, that at the time of the merger proposal, Delta forecast annual operating earnings of better than \$7.00 per share for the combined system. (Net operating earnings amounted to only 42 cents per share this past year.)

► **Unexpected Headline.**—Operations this year had to overcome a number of losses not previously anticipated. For example, resignation of employees of the two companies and attendant pay awards in keeping with the so-called Washington labor formula had to be absorbed by operating earnings. This same type of absorption caused the Shell-Pilling Tug to collapse.

Of more significance, too, is the company's uncertain status as to subsidy and prospects. As a result of a Supreme Court decision upholding the Post Office position that income earnings from domestic operations should offset international mail subsidy payment, the company is in an "open sale" period from May 1, 1955 forward. The case is now before C-48 for review.

► **Better Quarter-Results.**—For Delta's three months ended Sept. 30, 1955, the first quarter in its 1955 fiscal year, reveal a much improved trend. Also, this quarter is the first which contains the merged airline to compare results with the late 1953 period on a uniform basis. For this September 1954 quarter, Delta reported net operating income (before various adjustments and taxes) of \$632,415, compared to a loss of \$49,867 during the same three months in 1953. After these adjustments and tax provision, the current quarter reveals a net profit of \$271,423, contrasted with a net loss of \$75,216 for 1953.

The improved results reflect the increase in passenger revenues, up from \$18.1 million to \$18.9 million, a gain of about 10%. Reported earnings for both periods, of course, are subject to subsequent audit rate adjustment on

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the international division. CAB reports indicate that the international division showed an operating loss of \$162,000 in the current quarter.

At the time of the merger, Delta's fiscal results indicated that operating revenues for the combined system would "reasonably be expected to reach the \$55 to \$60 million a year mark in the latter part of 1954 and 1955." For the fiscal year ended June 30, 1954, total revenues were \$39.5 million, up about 52 million over the preceding year for the Delta and CAB system combined.

For the quarter ended Sept. 18, 1954, total revenues aggregated \$15.2 million, an increase of almost 17% over last year. A combination of this trend should permit the company to attain its objectives by next year as planned.

Working Capital—Delta's financial picture was able to break the expense incident to the integration and also show improvement. As of June 30, 1954, there were \$18,355,600 in 14% subordinated convertible debentures outstanding. The company also has a credit agreement permitting the borrowing of up to \$20 million on seasonal notes at 3½% interest. This loan will be repayable in 36 quarterly installments starting 15 months after the date of each loan. At Sept. 18, 1954, \$14 million in such loans were outstanding.

Net working capital, which stood at \$8.7 million at June 18, 1954 (improved to \$8.9 million three months later). At Sept. 18, 1954, the company was also entitled to receive on DAC 7a and related spare parts. After applying advances of \$2.5 million to the expenditures, the company will be required to pay about \$6.7 million in addition to complete the capital acquisition.

Depreciation should provide a substantial cost throw-off, amounting to \$5,275,152 during the 1954 fiscal year and about \$1.5 million in the recent September quarter.

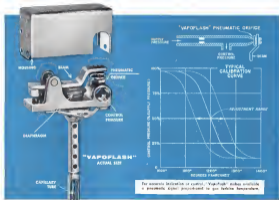
Equity Position—Net equity for stockholders reached a new peak of \$17.06 per share as of June 30, 1954. Sharp reduction was being effected by the re-amalgamation account capitalization resulting from the merger. This account, reflecting the excess of the fair market value of flight equipment acquired from CAB over the net book value at the time of the merger, May 1, 1953, stood at \$1,733,381. On June 30, 1954 it had been reduced to \$991,992, and three months later to \$523,798. While such charges tend to reduce reported earnings, they also serve as a source of cash throw-offs in the near future as depreciation.

In line with present airline trends, Delta's operating earnings for the 1955 fiscal year are likely to exceed 1954 results. Capital gains, however, from sale of equipment are likely to fall far short of last year. —Selig Altschul

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## OVERSEAS SPOTLIGHT



LITHGOW after ejection-seat flight.

### It's Safer in the Air

EDITORIAL

LE Col. Mike Lithgow, chief test pilot of Vickers-Armstrong Supermarine Division, is leaving that sensation you can have most trouble in the ground than when sailing through the stormy waters up in the wild blue yonder.

Britain's new Minister of Supply, Selwyn Lloyd, has ordered an investigation into Lithgow's recently published book, "Much Due." The London Times quotes the minister as saying that the book contains "confidential information in respect of military aircraft as a national origin." The minister states that no aspect had been made for permission to publish the classified information, but since the book was already distributed at home and abroad, "no useful purpose would have been served by asking to postpone publication."

Lithgow set a world speed record in September 1955, flying a Swift F 4 at 715.7 mph in Libya.

### Trouble in Scandinavia

EDITORIAL

The Norwegian author, South American and Far Eastern Airlines (SANTO), is turning its sights on the British airline, Scandinavian Airlines System.

Two three governments registered as SAS-Sweden, Denmark and Norway—have made it three "closed" markets for foreign service and now have gone to court on national, domestic routes too.

SANTO had established a base in Scandinavia in the Far East, but its original certificate was turned down by the Norwegian government to avoid competition with SAS. SANTO's interest in Norway has been extreme, however, but the traffic patterns of the three governments have indicated they will not be served until SAS has time to

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present a plan for development of domestic traffic.  
 Klippelgren Baerlin, founder of SAEF, stated: "When the national authorities in Sweden and Denmark can make the decision about domestic flying in Norway, things have come to a pretty pass."

#### Germans Revive Research

Two major aeronautical research centers are being established by West German scientists.

Already organized is the Deutsche Versuchsanstalt für Luftfahrt at Ems Meibohm Airport under the leadership of Prof. Dr. August Wilhelm Quast, also associated with the University of Aachen.

Being organized at Braunschweig is the Deutsche Versuchsanstalt für Luftfahrt, to be headed by Prof. Otto Lutz. There may also be acting as technical advisors for newly organized Luftfahrt institute.

A source close to these new research centers has told Aviation Week that experienced military aircraft projects are high on their pending agendas and that the Germans hope to be major suppliers to NATO in 1958. It is reported also that Prof. Kurt Tank, Focke-Wulf's top designer during World War II, has returned from Argentina and is expected to join DVL-Trauer Meibohm.

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## ATA President Claims:

# Airlines Caught in Fare-Cost Squeeze

- Profits suffer because fares have stayed down while expenses have risen, Johnson tells security analysts.
- Air transport needs investor confidence for support of jet, turboprop, copter, freighter and airways plans.

By Frank Shea, Jr.

Chief problem of the air transport industry today and one from which recovery all other times is how to attain the water profit margins sustained by its ever-increasing volume of business.

Speaking before the New York Society of Security Analysts last week, Air Transport Association President Earl D. Johnson said a big reason for this problem is the fact that despite a strong upward trend of costs, airlines have been operating under a "flood, even a deluge, average loss."

This upward trend applies to both the price of equipment and facilities the airlines pay and the wages they have to pay their employees. Johnson noted he pointed to the steady upward rise of consumer prices over the past 15 years, with the exception of the price control period during World War II.

Cost-Fare Conflicts—"The significant thing is that neither the consumer price level nor the average airline payback has dropped since 1934," he said. "Endure against a 1935 base index at 100, our cost level stands at 183.5, consumer prices at 192.2 and the average airline payback at 228.0."

"How have we been able to avoid major financial difficulties with such a level consumer balance, rising operating costs and static fares?" Johnson asked. He gave four answers:

- Substantial and continuous growth in volume.
- Technological improvements in both aircraft and related equipment.
- Increased productivity of the individual employee.
- "Truly superb" effects of savings.

He also gave a fifth reason: "The degree of our past and prospective understanding of the Civil Aeronautics Board is the administration of the Civil Aeronautics Act, and of the executive and legislative branches of the government."

Major Programs—"The air transport industry, with its chronic growth trend and continuing stream of technological

improvements, should receive for years to come, requiring huge amounts of new capital," the ATA chief stated.

"Looking ahead, say for the next 10 years and I doubt that anyone can get a much more exact timetable as that occurs than 10 years it is reasonable to expect that we as an industry will engage in five major capital expenditure programs." He listed the following:

- Substantial replacement of the prime powered airlines with turboprop transport.
- Introduction of a specially designed cargo fleet or a major conversion of the existing fleet to cargo type.
- The addition is said, to a limited extent, replacement of existing fleets with helicopters.
- Addition of a substantial fleet of jet aircraft.
- Major capital expenditures for ground, flight line and aircraft equipment and facilities.

Johnson declined to try and give an exact dollar figure for the total of these capital demands but said it certainly would be in the \$1.5 billion to \$2 billion range. He added some studies indicate the total could hit \$2.75 billion.

Investor Source—"It is not at all unlikely that within the next five years we shall see widespread underwriting of a single piece of financing totaling \$100 million," Johnson said. "Much of this required capital will come from depreciation reserves. Another substantial segment will come from retained earnings."

"But a very large part of it, of necessity, will come in the form of borrowed funds. This means looking to the public and the institutional investor as a source for funds."

"Management's recognition of both the magnitude of its financial problems and the understanding of its capital requirements has been, of course, a necessary prerequisite to achieving success in obtaining these funds."

"However, there is a limit to what management can do. There is a limit to the contribution that investors can be called upon to make in the way of interest or even longer developments. There is a limit to the improvements that can be achieved through more advanced equipment, there must even be an overall limit to our growth."

"We must, look to government for understanding regulations and administrative action," he emphasized.

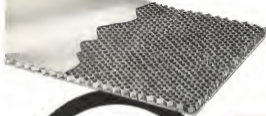
Financial Problems—"Pairing to a growing spirit of cooperation between government agencies and the industry, Johnson cited ATA's agreement before CAB last year to explain the industry's economic and financial problems."

He said a similar agreement will be made this week with ATA complaining:

- Rising costs with static fares.
- The need for forward-looking regulations that will allow the industry to stay financially sound and thereby continue to support 110,000 employees.
- The industry's continuing need for large amounts of new capital—"Capital which can only be attracted if it is allowed to earn an adequate return and, of course, this includes the need for us to regulate the industry so as to allow management to pay reasonable dividends."

"In short," said Johnson, "ATA seeks regulations which will allow management to exploit all the potentials as best as they dynamically expanding industry."

Corroborating Gates—He told the group there is in the making a regulatory climate or environment, and a legislative one that, if continued, will



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## Air-Rail Mail Fight Splits CAB

Josh Lee files strong dissent against Board decision setting temporary rate in West Coast experiment.

By Craig Lewis

The battle over field light use coming under mail is in its final stages. In a nine-hour CAB Administrative Board, with member Josh Lee filing a strong dissent from the majority decision to set a temporary rate for the West Coast experiment (Aerobase Week Nov. 15, p. 50).

Previously the Board concerned unanimously on temporary rates for airlines flying surface in-flight and on the ground to determine the original contribution of temporary rates for the East Coast project in establishment of the same rates to Sept. 30, 1975, to establish the experiment, and the setting of rates for an actual local service contract.

Confined to Rate—Showdown on the experiment is expected when CAB opens final proceedings ordered to set rates for the extension of the East Coast experiment.

The Board indicated the proceedings will be confined to rate considerations. The railroad, however, contends the experiment is illegal and may seek a court test (Aerobase Week Oct. 6, p. 70).

Tentative to Decide—The Board has recognized the substantial interest of the railroads by forcing this participation in the final rate proceeding.

In his dissent, Lee says, "What the majority fails to recognize, however, is that unless the railroads are allowed to participate now in the temporary rate proceeding, there will not have an opportunity to present their views on the Board has made its decision because the decision from the railroads comes at a time in the temporary rate becomes effective.

For all practical purposes the question of intervention only in the final rate is tantamount to a denial of the railroads' request that they be given an opportunity to be heard before the Board reaches a decision."

Requirements—The dissenting opinion supports the use of the temporary rate but points out that CAB had described two experiments when it set up the temporary rate procedure. "An airline must show that its economic financial position is critical."

It must appear that its carrying rate is substantially inadequate.

Lee was northern of these two experiments is present in the railroad project. "The Board is not now faced with an emergency which requires it to set such much later that it must disregard

the statutory requirements of notice and hearing," he adds.

"Of course the railroads can present their views in the final rate proceeding as the majority supports, but that is lacking the time due after the issue has been taken. If, as the majority order states, there will be the usually long and arduous process involved in formal final rates, considerable injury could be inflicted upon the railroads."

Question of Authority—In his position to CAB, the railroads question both the Board's authority to set a rate on the class of mail service and the Postmaster General's authority to offer such mail for no carriage. They also question the basic and competition of the rate asked by the Postmaster General.

The Board expects the first contract and Lee again with the majority that the Civil Aeronautics Act gives CAB power to classify service while it sets rates but he feels the Board's action will prevent it from going into the question of "whether a basic definition is being maintained between airmail service for mail and on which the full service has been paid and airmail service on mail carrying three-cent postage."

Lee asks "Is there a real and valid difference between the handling of 'surface' mail and the handling of regular airmail? If so, what is that difference?" He says the rate of 16.5¢ cents for air

freight is less than half that paid for regular airmail.

Of the Postmaster General's authority to offer surface mail for air transportation, the majority decision suggests that carriers would be the place to settle the case if the railroads want to pass it. Lee says it would seem that the Board's responsibility in implementing what may be an illegal act should be maintained before and not after the action is taken.

ATA View—Meanwhile, Stanley G. Wren, assistant to the president of Air Transport Association, describes railroad opposition to the experiment as an "unsubstantiated attempt to prevent progress and delay discussion of services from the railroad would be frustrated."

"We have been accused by the railroads of drawing their support from the detriment of their financial health," he says. "Let me state that in 1973 the total first-class mail carried by the railroads equaled two thirds of 1% of total national operating revenues. Our net profit in 1973, of the total postal revenues of \$147 million, first-class mail totaled only \$40 million."

"If the airlines carried all of that mail it would represent an insignificant and small to a multi-billion dollar mail industry."

So far, the first-class mail experiment has succeeded. That success is very likely the reason for objections from people with a stake in moving the mail to other means. Congress, however, has a long record of supporting better postal service for the public. If the experiment is again put to them to stand up and be counted for progress, it is hard to believe that every congressional member would refuse to do so."



Old and New Convair Turboprop Transports Meet

Convair's new TC-119C (left), powered by a 1,700 hp Allison T56-A-3 turboprop, was used for the first time by the FAA, owned by Alaska Division of General Motors and powered by Allison T56-A-3 turboprops, was the latter used by the FAA.

Workshops are doing a demonstration test. The TC-119C is the second of two Convair 119s converted to turbine power at the company's Ft. Worth Division. Air Busco Development Inc. is evaluating the turboprop power in transport.

## New Costa Rica Field To Take Big Airliners

(McGraw Hill World News)

San Jose, Costa Rica—This capital city's new 5,000-foot Costa Airport will be opened officially next June giving international airlines a field large enough for four-engine transports for the first time.

Costa will have the first VOR (visual) runway to be installed at a commercial airport in South America. Captain Noel Combs—Major Morales, Costa Rica's Director General of Civil Aviation, says the new airport will be the largest and most complex in Central America. It will have a 6,000-ft paved runway that can be extended in the future to 8,000 ft.

Because of this runway and new larger facilities, Pan American World Airways, KLM Dutch Airlines, TACA International Airlines and Costa Rica's national LACSA are expected to switch to four-engine jets on flights into and out of the city next June.

On domestic routes, LACSA will continue to operate two-engine transports.

CAB Approval Step—Hanger sheds will include a single installation capable of handling four Lockheed Star Coustrations at one time. In addition, the SAA airport shops-the safe storage maintenance facilities in the Central American area operated by Civil Aeronautics Administration—will be moved to Costa.

Lighting facilities being installed by Washington Electric Corp. will allow 24-hr. operations compared with 12-hr. at last year at the present inadequate Sabana Airport.

Major Taxis into Sabana probably will be abandoned once the new airport becomes operational.

The new airport is being financed privately by the Costa Rican government with no foreign involvement. The government will own and operate Costa under the direction of Major Taxis.

## LAA Starts Copier Passenger Service

Los Angeles—Los Angeles Airways is scheduled to begin passenger flights on this week (Nov. 12) between Los Angeles International Airport and the downtown Long Beach Airport.

LAA expects to follow the current passenger service with flights to other southern California cities only next year, according to president Clarence Rivlin.

Initial flight schedule calls for six nonstop daily, each requiring 12 min. for the 15-min. hop. Flights are

linked with north-south arrivals and departures of limited surface departing out of L.A. International (Aerobase Week Oct. 25, p. 45). The service, including taxi, has been set at \$4.

LAA has established the following fares for its planned scheduled service: \$3.55 one-way, tax included, for service to and from community airports located at a maximum radius of 10 mi. from L.A. International. \$6 for those within a maximum of 18 mi.; \$7 within 40 mi.; \$8 within 65 mi.

A first of last seven-passenger Skyliner 53 helicopters will be used.

## Nonskeds Start Drive For Clearing Hours

Nonscheduled airlines started their drive for a central clearing house to jettison out commercial business at airports last week before Civil Aeronautics examines Post Office.

The new national organization—National Association of Air Transport and Air Cargo—has organized to coordinate exchanges for information on military traffic available to their members.

The pending CAB case will decide whether they are to be able to operate such an exchange, considering the shipper demand with the availability of services on a commercial basis.

Scheduled airlines are opposed to the operation of the "air exchange" on grounds that it would create complicated control jurisdiction to operation of a single national line.

Under IMATA and ACTA agree to merge, there is the prospect of competitive exchanges for the two groups.

## Riddle Asks Speed Up On Cargo Certificate

Railroads Airlines has asked Civil Aeronautics Board to speed the south-south phase of the air/rail reread case from the consolidated proceeding to speed action on the Riddle's application for certification in a cargo contract.

Riddle was the south-south phase of the case will be ready for decision while the current may be delayed by some late-developing view of the shunted merger of Slick Airlines and Flying Tiger Line.

The petition, under the Air Commerce Commission's civil air policy and the Interstate Commerce Commission's support of various shippers is an immediate need for the reread, the possible air/rail service between south and north.

Riddle's application in the proceeding as a "surface" currently limited by, or dependent upon, air/rail application," the company says.

## RTCA Proposes VHF Field Light Trigger

Operation of field lights by means of coded VHF transmissions from aircraft to permit night landings at unattended airports is recommended by the Radio Technical Commission for Aeronautics.

The RTCA VHF system uses the first 30 channels of 121.7 and 121.9 for all aircraft and, in addition, 121.5 for private aircraft. Recommended allocation of the 121.7 and 121.9 frequencies is in addition to those present in a general clearing house, which is a 121.5 frequency now in need for a two-way communication system available only to private aircraft.

Code System—The recommended system consists of five codes produced by pressing and releasing the microphone button of the aircraft VHF transmitter.

The decoder at the field will accept only one of the codes to prevent activation of more than one lighting system at any one time.

The code signals also prevent turning on lights when the frequency is being used by communication.

24-Hour Program—Aeronautics system for the operation of field light duty air-ports have been evaluated in the last 30 years.

The audio and video systems were used most recently. The audio system consisted at a microphone on the ground that picked up the sound of an engine or engine and propeller.

The radio system used a ground station that picked up high frequency transmissions directly on 100 MHz.

Drawbacks—Both the audio and radio systems required some modifications. The radio system required a sensitivity low enough to prevent activation by ground noise, thunder and air sounds as large aircraft passed overhead at crossing altitudes. The audio system, however, for small aircraft to pass directly over the field at low altitude with full power.

The high frequency radio system was an alternative because of electromagnetic interference produced by lightning and other atmospheric disturbances that sometimes caused continuous operation of the lights. VHF minimizes the disturbance of VHF.

ATA Response—The VHF band has been made last year by Business Air Lines, and three airlines purchased a second line. Air Transport Association (ATA) has an overall study of the construction of field light systems.

BACA has asked Federal Communications Commission to some rules required to use the three frequencies and recommended that Civil Aeronautics Administration select the necessary frequencies, assign codes and publish the information in the Aeronautics Guide.





## Tackle the Collision Menace

Despite some more general discussions, which have ignored attention of the menace, the danger of aerial collisions has not dropped off the past year, and some authorities believe the ever-increasing air traffic has brought us face to face with no end emergency.

All of aviation must come to grips with this subject seriously. Why not now, before grisly headlines shock us into it?

## Over the Arctic to Europe

With a daring move reminiscent of those played, Scan Airlines has opened a new air trade route over the top of the world between Los Angeles and Denmark, flying south of the way over arctic land via Winnipeg and Greenland, and rising from 500 to 1,000 miles off the traditional route via New York, at a comparable reduction in fare. The passenger has no change of planes.

Although direct European air service has been available for years from a few inland points in the United States, SAS opens up the first direct route from the populous and great West Coast, in southern California.

There are pessimists who are casting doubt on the wisdom or need of such a service. "Transoceanic lines on one plane in a long time" and "most Americans prefer London, Paris or Rome." But there always have been skeptics, and aviation has grown faster than any other transport machine the world has ever known because it dared to try what the pessimists said was impossible or unnecessary.

New air routes are inevitable; some will fail miserably. But new routes and new aviation aviation must always fight for, as we create our growth and hope to weather.

It will be no black mark for SAS if the route does not pay off immediately. Many new routes in the past have achieved profit only after extended periods of efficient service. The new route, like many others before it, may divert some business from established lines. But more important for aviation, it should create its own business, traffic that no other airline ever carried before.

The urgent task for aviation here at the old one all over again—that we still exercise enterprise and initiative and dare the unprecedented. It's astonishing how often—it has the chance—the public takes to a new and sound idea.

## A Piper Flies to Paris

Bill Piper and his loyal associates at Look Haven, Pa., are looking in the placards of aviation people everywhere. So not the wisdom and execution of *Aviation's* Learning Division.

There was a true engine Piper Apache, with Lycoming Model O520 engines (150 hp.) and Dartmouth construction, full-fledgedly popular that was set for delivery to Piper's export representatives in Paris. Now Comrad flew it nonstop from New York over a weekend.

According to William Strohmeyer, spokesman for

Piper, Comrad's gross load at takeoff from Idlewild was 5,000 lb., a 1,500-lb. overload. Takeoff distance was 2,500 ft., with a 6 to 8 mph. crosswind. He left Idlewild at 11:27 A.M. Saturday, Nov. 6, passed over Gander at 6:35 P.M., crossed Shannon at 5:18 A.M., Nov. 7, and landed at Paris' Toussaud Le Netre Airport at 9:50 A.M. Eastern Standard Time.

This meant that the Apache covered the 1,625-mile official New York-Paris distance in 22 hr., 23 min. An official report said he had 70 gal. of fuel remaining, which means an average fuel consumption of 12.88 gal. an hour. His average speed was 161 mph.

What about instruments? They were the standard installation on all Apaches. Nothing was added.

Radio? Strohmeyer says that was standard in delivery in the Custom Apache for domestic use, including Navco Omronics with ILS localizer and 8-channel transmitter, Navco Synflex 12-channel VHF transmitter receiver, Lear ADF-12 automatic DF. A Sunny South MP transmitter was added.

The two 16-gal. wing tanks were supplemented by three extra tanks holding 288 gal., or 500 gal. of fuel at takeoff. Comrad also installed a system for adding engine oil. Range with this setup was estimated at 25 to 30 hr. "Comrad wore a USAF exposure suit and a Mac West life jacket," Strohmeyer writes. "Food consisted of boxes of granular crackers, two Colas and a grapefruit. Slices of asexual clothing."

The plane, owned by Jones Aircraft & Airtax Co., Inc., of New York, Piper export representatives, will be used in Europe and North Africa for demonstration purposes. Piper says analysis shows flyway delivery is "the easiest and most practical" than shipping to any part of the world.

That's the story, simply told. The facts need no elaboration. We congratulate overboard concerned. What a testimonial for Apaches!

## No Deaths—No Headlines

It didn't appear in many newspapers, but Hawaiian Airlines made up with a highly important story the other day. It celebrated its 25th anniversary on Nov. 11, which makes it one of America's oldest commercial air carriers.

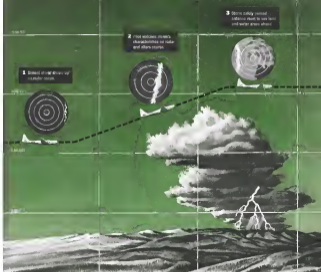
But the headline-making aspect—at least for an aviation magazine—is the added fact that in its entire history Hawaiian has never had a passenger or crew fatality or injury.

We are informed that in those 25 years, the line, founded by Stanley C. Kennedy, who is still its president, has carried 1,675,000 passengers, averaging 142 million passenger-miles. It has won the National Safety Council's *Airplane Safety Award* every year of its life.

The owner's Ned Dornheim calls Hawaiian's "the longest record of safe operation in aviation history."

Hawaiian's achievement is big news. Too bad there weren't big, black headlines splattered all over the nation's dailies.

—Robert H. Wood



## NEW RADAR GIVES USAF POWERFUL EYES

Sees Storms, Obstacles up to 240 Miles Away

### THE STORY BEHIND THE STORY:

Unveiled at the National Aeronautics Show in September, the new Sperry APN-59 Radar developed for the Air Force made headlines like the one above from coast to coast—and for good reason.

Armies have needed and wanted such versatile radar. To make navigation more accurate—30 and 40 flying over obstacles

unobstructed terrain—to detect storms—to avoid collisions—to direct routes regardless of visibility. But—there has been a problem. Existing radars, to perform all of these functions, have required too much space and added too much weight.

Working with the Air Research and Development Command, Sperry engineers solved the problem by producing a new instrument that requires less space than a passenger's luggage than 120 pounds

And versatile! Despite its small size and weight, this new APN-59 Radar now gives mission a selection of targets from 1 to 240 miles—a choice of looking straight ahead below or above—and permits concentrating on any particular area of importance.

Developing the APN-59 Radar brought into play many of Sperry's specialized ARD Electronics—a field in which Sperry's development of the X-ray gun provided the heart of today's microwave radar. Cyclotrons—to create "particle" stability in rough turbulence. And of course, sound instrumentation based on Sperry's 44 years of experience in establishing standards for the aviation industry.

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